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Editors
Kenneth H. Condit
Fred H. Colvin

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What Modern Equipment Has Done

One of a series of articles giving the actual results achieved by replacing obsolete with up-to-date equipment

Shop No. 1

The Treadwell Engineering Company

By A. A. Neave
Vice-President and General Manager

ANALYSIS of equipment needs in shops other than those on a "production basis" is not always sufficiently positive to obtain the O.K. of the financial department to the requests of the producing department. The producing department itself many times does not understand how enough money can be saved by modern equipment to justify spending the enormous difference between the cost of the new and the second-hand or scrap price of the old. The surest way to find out is to try the exchange. Another way is to check up on the experiences of other shops with comparable products or lines of work.

The Treadwell Engineering Co., of Easton, Penn., has made its exchange, and at the request of the *American Machinist* presents examples of the results for the use of the more timid, or more conservative, or simply more backward equipment users, in gaging their own equipment programs. Large lots of parts are almost unknown in the Treadwell shop, the products are subject to great variety, and business must be secured against competition. These factors are the most common deterrents against a new equipment program, and to the extent of their influence should reduce almost all shops to the same level.

Both large and small parts enter into the makeup of Treadwell products, which consist of rolling mill equipment (hot beds, tables, transfers, conveyors, coilers, gages, manipulators); tube mill machinery for handling, threading, and cutting pipe; hot-metal and cinder cars; and a miscellaneous line of special machinery that is designed and detailed by the members of the engineering department and which, of course, offers many difficult equipment problems.

Bids for orders are based on production records and cost estimates. For every operation on every order there is kept a record of the actual time required. It is from these time records that the estimating department draws the information used in estimating the labor and machine costs for new work. Due to the constant comparison that is being made between time estimates and time requirements on given equipment, and between time requirements on old and on new equipment, the estimating department has the equipment facts. Savings on individual jobs are evident from the records. Savings on the shop end as a whole, due to modern equipment, are expressed in increased business. This increase was 100 per cent for the period from July, 1926, to July, 1927, over the period from July, 1925, to July, 1926. Moreover, there has been an immeasurable increase of customer good-will resulting from earlier deliveries and products of better quality.

The machine shop is equipped with 75 active machine tools and 200 men are employed in two shifts. Included among the 75 machine tools are the following new machines purchased during the last half of 1926 and the first half of 1927:

One 48-in. planer
One 32-in. shaper
One 4½-in. horizontal boring machine
One 72-in. vertical boring mill
One No. 4B knee-type milling machine
One 24-in. turret lathe
One 30-in. engine lathe
One 25-in. engine lathe
Two 21-in. engine lathes
One 19-in. engine lathe
One 7-ft. radial drill
One 10-in. cold saw

In number, the thirteen machines represent 17 per cent of the total equipment. In increased productive capacity they represent a great deal more than 17 per cent, since all of them were bought to replace machines that were

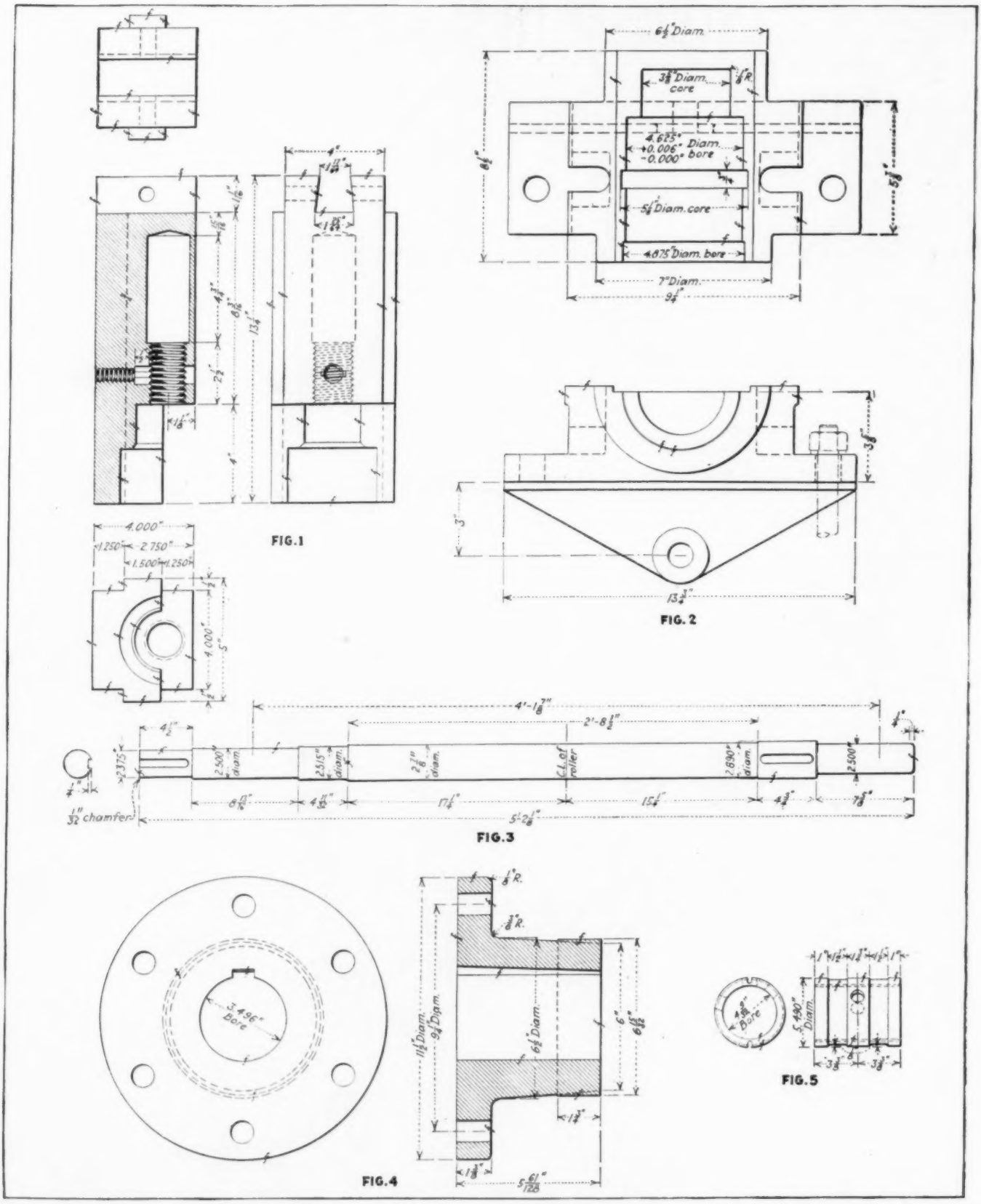


Fig. 1—Gripping Slide. Tool steel. Shape complete. Time on old 28-in. shaper, 5 hr. Time on new 32-in. shaper 3½ hr. Time saving, 25 per cent. Fig. 2—Roller Bearing. Cast iron. Face, bore and counterbore. Time on the old horizontal boring mill, 65 min. Time on new 25-in. heavy-duty lathe, 25 min. Time saving, 61 per cent. Fig. 3—Roller Shaft. Steel, 40 to 50 point carbon. Finish turn from black bar. Time on old 20-in. engine lathe, 4 hr.; on new 21-in. engine lathe, 2 hr. Time saving, 50 per cent. Fig. 4—Half Coupling. Carbon steel. Face, turn, and bore. Time on old 24-in. engine lathe, 2¼ hr. Time on new 25-in. heavy-duty engine lathe, 1½ hr. Time saving, 33 per cent. Fig. 5—Bushing. Cast iron. Turn, bore, and face. Time on old 20-in. turret lathe, 45 min. Time on new 24-in. turret lathe, 20 min. Time saving, 55 per cent

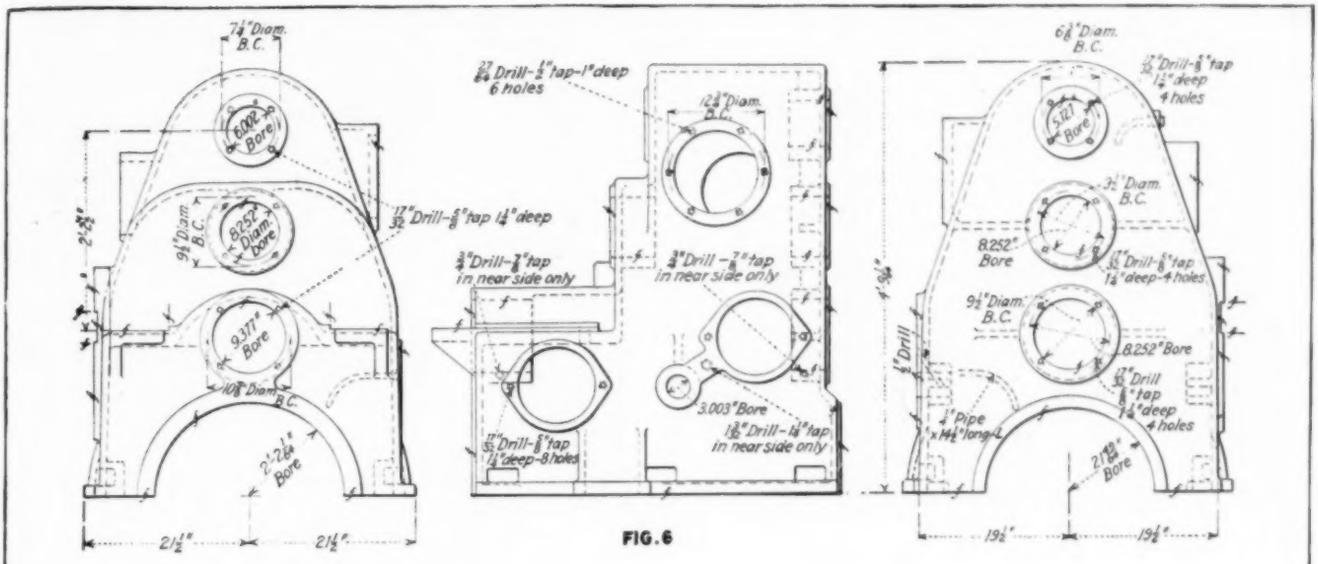


FIG. 6

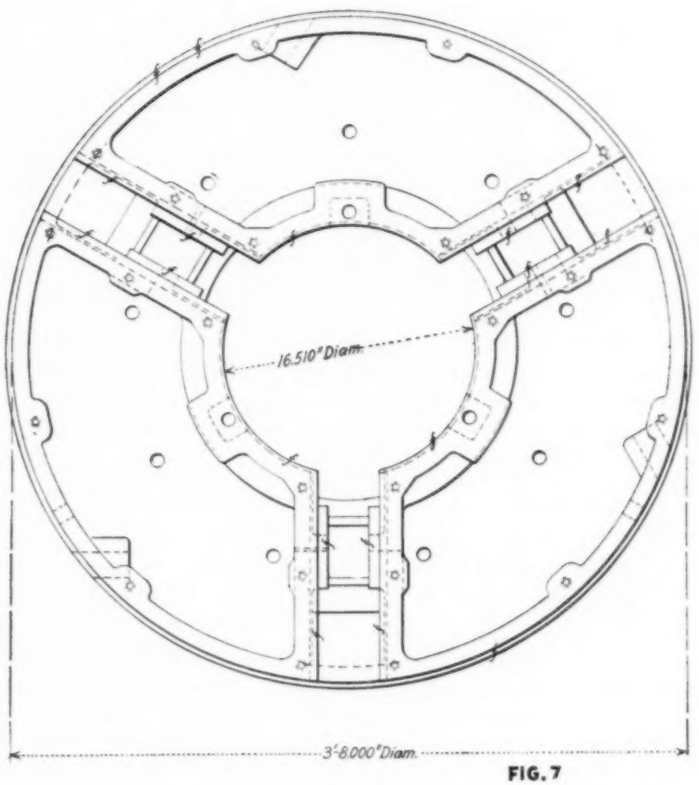
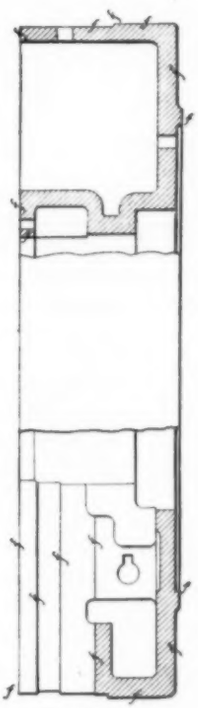
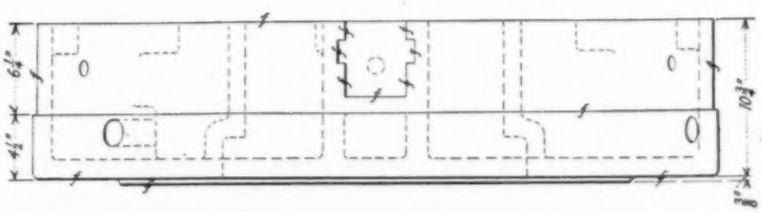


FIG. 7





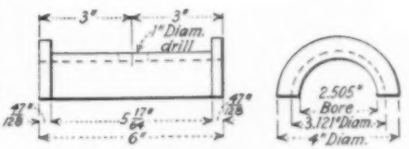


FIG. 8

Fig. 6—Headstock. Cast iron. Bore complete. Time on old horizontal boring machine, 25 hr. Time on new No. 4B knee-type milling machine, 18 hr. Time saving, 28 per cent. Drill complete. Time on old 6-ft. radial, 25 hr. Time on new 7-ft. radial, 19 hr. Time saving, 24 per cent. Fig. 7—Gripping Head. Cast iron. Turn, bore, and face. Time on old 48-in. engine lathe, 16 hr. Time on new 72-in. vertical boring mill, 7 hr. Time saving, 56 per cent. Fig. 8—Bushing. Brass. Turn, bore, and face. Time on old 20-in. lathe, 90 min.; on new 19-in. heavy-duty engine lathe, 25 min. Time saving, 72 per cent.

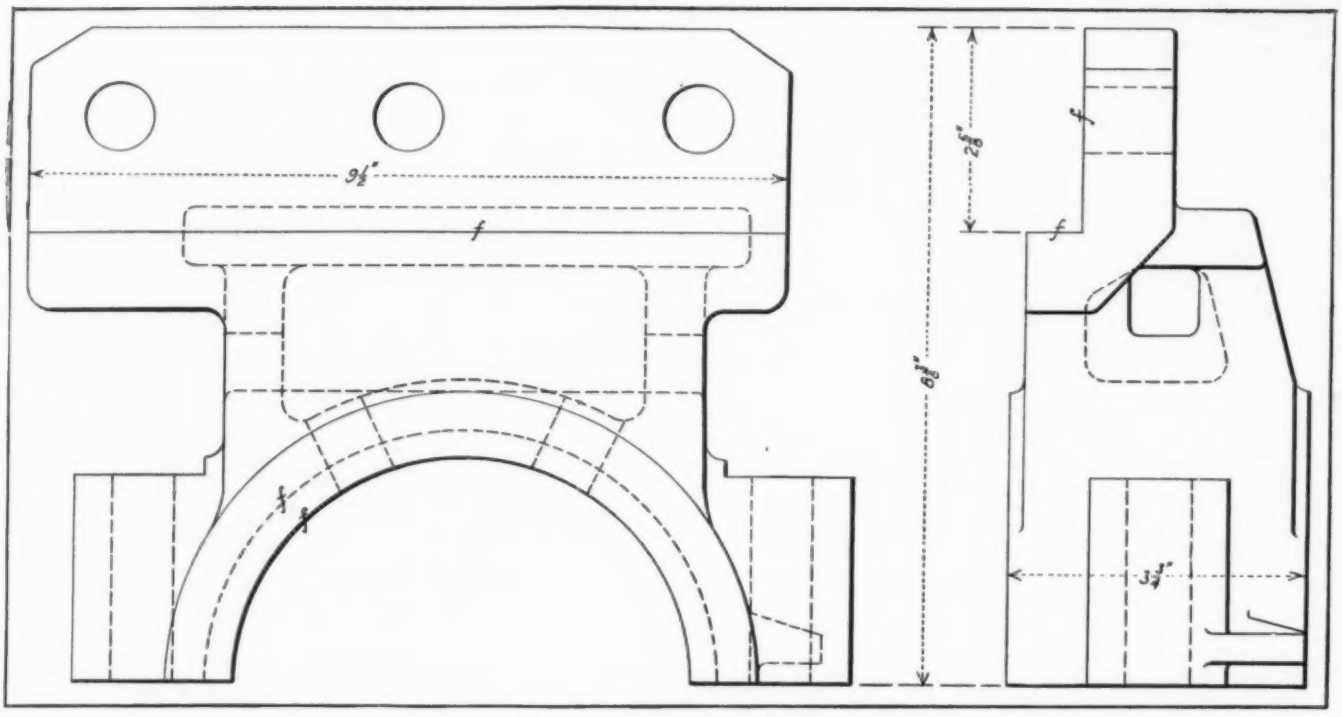


Fig. 9—Eccentric strap. Cast iron. Mill 3¾-in. and 2⅛-in. faces. Time on old milling machine, 30 min.; on new No. 4B machine, 8 min. Time saving, 73 per cent

from six to ten years old. It is a matter of policy to buy large tools, because both large and small parts can be machined on them.

In Figs. 1 to 9, inclusive, line drawings are given of parts picked at random from finished parts on the floor when the data for this article were compiled. Consistent with the statement that the machines replaced were from six to ten years, old, the times given as "old times" were taken from records made on such machines.

Work done on the cold saw is not illustrated. However, this machine, also, has proved itself as an investment. For example, bar stock, 10 in. in diameter is now cut off at the rate of 1 in. per minute. On the replaced cold saw the rate was 1 in. in 5 minutes. The production increase for this particular operation is 400 per cent.

Omitting the record of the cold saw, in the interest of conservatism, the average time saving on the examples shown was 48 per cent. Since these examples were picked at random it seems safe to assume that this average will hold good on all of the work done on the new equipment. However, allowance must be made for idle time because of the nature of the work and because the full capacity of the shop is not always sold. A more reasonable figure would seem to be somewhere between the 48 per cent increase in production and the 100 per cent increase in sales. On a conservative figure of 50 per cent increase, the new equipment will pay for itself within a remarkably short time.

What Should a Director Do?—*Discussion*

By Entropy

THE article under the above title in Vol. 67, No. 23, by Mr. Wainwright seems to me to be another case of the "right pew but the wrong church."

The present state of the machine tool business is a direct outcome of the war when machine tools were needed as never before. Manufacturers rose to the occasion and built bigger and better shops. They increased capacity far beyond the possibility of consumption in peace times. We now find that every order for lathes, planers, millers or whatnot is needed by a dozen manufacturers. They either spend their possible profits to get the order by good and expensive salesmanship or by the more direct method of cutting prices.

And this present condition is by no means unusual. The years following the civil war saw the same condition. The automobile saved the machine tool business. Shops that were ready for the bankruptcy courts in 1914 were making money hand over fist in 1916.

The solution is not in reduced overhead charges, nor is it so easy a matter to raise prices. Or rather it is easy to raise prices but impossible to get business at the increased prices, so long as there are shops that prefer a small loss to a big one. And that means until the next war, or some revolution in mechanical business.

The machine tool business is elastic as far as orders are concerned and inelastic so far as production is concerned. What it needs is some organizing genius who will combine with it the manufacture of some luxury that is cut off the list as soon as war breaks out, but which will necessitate a very similar equipment to that used for making machine tools.

Members of the General Motors Savings Fund Class may borrow money to buy a home without losing any benefits of the plan. Of 8,300 members, 4,000 are taking advantage of this to buy homes.

· EXECUTIVE · FORUM ·

Executives are invited to discuss the problem involved in the following case
Accepted contributions will be paid for

The Cost of Haggling Over a Guaranty

SAMUEL HARDY, manager of the Star Engine Co., was in trouble—or thought he was. Last year he had had a special machine built at Miller's, a local shop that has built up quite a reputation for ingenious and productive machines. The machine had done good work—and then he had ordered an attachment for it, without getting a contract price. The bill staggered him, and, believing that Mr. Holland knew everyone in town, he asked him to advise him in the matter.

"You see, Mr. Holland, Miller built me the original machine for four thousand dollars and then has the nerve to charge me three thousand for this attachment. It's highway robbery, Mr. Holland. If he persists in making me pay that bill I'll never send him another job."

"And from what he says, Mr. Hardy, he'll never take another job unless you do pay the bill. Let me ask you, Hardy, wasn't the machine satisfactory?"

"Oh, yes, indeed. Best machine we ever had."

"And was there any trouble about its meeting his guaranty?"

"Why-er—yes, there was a little. You see it didn't quite meet the guaranty at first."

"So Miller told me. Said he based his guaranty on the castings you gave him to experiment with and that those you had in your shop were considerably harder and not quite so true to pattern, so it took longer to chuck."

"He claimed that, Mr. Holland. Had quite a time getting the machine so it would meet his guaranty. Almost made it, but not quite."

"And about how much did the machine save you, Mr. Hardy?"

"Saved us a lot, Mr. Holland. Best machine we ever had. Turns out many times the work we ever got before—and it's better work, too."

"Even in spite of the harder castings?"

"Er—yes, Mr. Holland. Miller certainly did a good job on that machine. Took him quite a while, but he got it."

"So he told me, Mr. Hardy. And you held up payments until it met the last piece in the guaranty?"

"But that's only good business. Couldn't claim his money was due before, could he?"

"Guess he didn't ask for it, did he? Not even when he had to borrow from the bank to pay his men. No, that's Miller's way. But I'm not so sure about it being good business, Hardy. It's your demand for the last piece on that guaranty that makes Miller's price three thousand dollars on this attachment."

"But he can't do that, Mr. Holland."

"Oh, yes, he can—and he has. Miller told me the whole story. You saw the machine turn out more pieces than the guaranty in his shop. It failed to meet it in yours because of different castings—and he hadn't said anything about castings in the guaranty.

"And even though it was saving you money enough to pay for itself in six months you held Miller up and made him lose money on the job. So, when you went to him for this attachment, Miller saw his chance to recoup his loss and to make you see the error of your ways. He asked a high price for that to sort of even up. But I doubt if he'll ever build you any more machines anyhow. He says he's through building machines for other people to make profits with—so he's going into selling products and not machines."

"And you think I should pay three thousand dollars for an attachment when the whole—"

"Now you're getting excited, Hardy. We have been all over that. You held Miller to his guaranty when you knew it wasn't fair—and he lost money. He'll hold you to that price if it means a lawsuit. And you can't blame him much. If you'd played the game with him before, you would still have made a big profit—and he probably wouldn't have quit building machines for you."

"But three thousand dollars—"

"Just about makes up what he lost before. Better pay it and forget it, Mr. Hardy."

Johnson Passes Up Bootleg Tools

By John R. Godfrey

OLD man Johnson surely was peeved when I dropped in the other day. And the salesman who was the victim of his wrath—or should I say "ire"—was looking around for a chance to escape with what little self respect he had left. Little did my coming help him, for Johnson rehashed what I had missed and then took up the sermon.

"Godfrey," said he, "I've heard about people who occasionally swipe other men's ideas and cash in on them, but here's a bird who makes his living that way. How? Well, let me tell you.

"You know those new automatics I put in a few months ago. Cost a wad of money, I know, but they're darn good machines and will pay for themselves before the year is out. We had some special work and the makers designed some special tools that are pippins. They're human in everything except that they never forget to do the right thing at the right time. It took good designing to get them going right, and the makers very sensibly patented the whole thing. And that's where this bird comes in.

"He drops in this morning to 'save me money.' Wants to pirate the ideas and build me these tools at twenty-five per cent below the chap who put hours of hard brain work into the idea. Even says he has blueprints of the whole thing. Where did you get 'em, son?"

"If you're through riding me for a minute, Mr. Johnson, I'll tell you the whole story. The Modern Company first designed that type of tool for the Blank Pump Company's new job. As you say, a lot of time was put in on it and it's a peach. But the P. A. is a hard boiled guy and he thought he was being robbed. He doesn't know a thing about machines, only that his job depends on his getting the lowest possible price. So he asked for blueprints and the makers foolishly sent them.

Wouldn't Dare Sue

"Then the P. A. sent for me and wanted me to bid on making a bunch of these tools. Gave me the blueprints so as to save any designing. I asked him about the patent and he laughed. Said he bought so many machines of Modern that they wouldn't dare sue such a big customer. Of course I can build the tools for much less than Modern, not having any cost for designing.

"And so, knowing you had some similar tools I thought I could save you some money, too. It didn't seem quite right to me at first, but if such a big and successful concern as the Blank Pump Company follows that practice, it didn't seem as though I could afford to be fussy."

"Now what do you think of that, Godfrey?" asked Johnson. "Wouldn't that jar you?

"Young man," turning to the salesman, "if you get the notion it's O.K. to steal patents because the Blank Pump Company's P. A. hasn't any conscience, you're liable to get into trouble. You'll be getting into the 'oil' class and think you are the law.

"It's a mighty short-sighted policy—or it would be if the Modern Company had backbone enough to enter suit and forget the size of the Blank Pump Company, which needs Modern as much as Modern needs it. And if Modern quit designing new machines Blank would be up against it. Unless Modern can make a living we don't get new ideas, and copiers like you don't advance us a particle. We might save a few dollars now but it would be mighty expensive economy.

"If I were the Modern Company I'd sue Blank Pump Company if it was the last thing I did. Unless it does sue its patent isn't worth a hoot in hades. And if the other builders of similar machines would just back Modern up in this they'd have Blank eating out of their hands in a short time. The Blank Pump Company can't stay in the game without new machinery but it's got all the builders buffaloed and gets away with murder.

"Young man, if you can make a deal with the Modern Company to let you build me some of those tools—paying it a fair royalty, I might consider it. And Modern might be glad to have you do it. But when it comes to buying bootleg tools, or anything else, you can count me out."

Lettering Shop Drawings—*Discussion*

By P. H. White

ON PAGE 799, Vol. 67, of the *American Machinist* an article under the title given above, by Charles S. Hazard, discusses some of the defects of the lettering systems now in use and suggests a new system which would eliminate the errors that sometimes occur because of poor lettering in the drafting room and careless reading in the shop.

With years of experience from both the draftsman's as well as the machinist's standpoint I have reached certain definite conclusions. The first is that there are a considerable number of careless draftsmen who have a greater interest in getting the drawings out of their hands than in turning out a finished piece of work which any intelligent workman can easily interpret. No matter what system of lettering is used, if the draftsman is really interested in his work he can make his letters and figures so that they can be correctly and easily read.

If the draftsman will remember that his work is a message to some fellow workman whom he may never see, it should inspire him to make that message so intelligible that it will not be misinterpreted. If the draftsman is careless with any system of lettering it will be next to impossible to invent one that will be proof against his carelessness. The familiar safety slogan, "There is no safety device like a careful workman," applies just as effectively as regards lettering in the hands of a careful draftsman. A wise old tool-shop superintendent once gave this very excellent advice: "Make your drawing so it will stand in court."

From the viewpoint of the shop I am convinced that there are many careless machinists who are just "sitting on the fence," or in other words, not using their heads. They follow the path of least resistance, and rather than make a slight extra effort to be certain of any figure that might be questioned they make a guess at it. If it happens that this guess is incorrect, they "pass the buck" to the draftsman.

No matter how carefully a drawing is prepared, it will become soiled from handling, and the surest plan then is to get a new print. A careful and ambitious workman will make sure before spoiling a piece of work.

Personally, I consider capitals to be more easily read than lower case letters, but either can be made correctly and read correctly. Rather than adopt a new system of lettering, I would attempt to inspire both draftsmen and machinists with a sense of their personal responsibility.

Is the Buyer at Fault in Today's Industrial Market?

A composite article arranged by
K. H. Condit, Editor, *American Machinist*

"BUYERS' Market," "Over Capacity," "Unethical Buying Practices," "Profiteering," are catchwords that are heard on every hand in the industrial marketing discussions that occupy the leading place in the thoughts and conversation of industrialists today. They indicate clearly the extent to which the pendulum has swung away from the sellers' market of war days when buyers pleaded for deliveries and salesmen "accepted" orders at their pleasure. The sellers were accused of profiteering in those days just as the buyers are now.

Unquestionably the situation of many equipment manufacturers and distributors is extremely unpleasant, but is it entirely the fault of the unsympathetic buyer? To get an answer to this absorbing question I have asked a number of prominent men in the metal working field for an expression of opinion on the subject. All of them are engaged in the selling of some type of mechanical equipment and most of them have to pay some attention, at least, to the purchase of metal working equipment for their own plants. Unfortunately there is not sufficient space available here to give all of their answers in full but I believe I am presenting the principal ideas they have expressed.

MR. G. C. MILLER, president of the Dodge Manufacturing Corporation, thinks "that we have not grown up as a nation to our wartime productive facilities.

"It may be that the answer is in a battle for the survival of the fittest, and it may be for the national good that some of the unfit be eliminated. The answer may lie in the association of equipment manufacturers with the establishment of a code of ethics and a code of procedure. This remedy, however, is beset with a great deal of difficulty.

"It may arise out of a better understanding on the side of the purchaser of the fact that while he can play a game of beating down prices, the supplier frequently feels justified in beating down quality in spots that are hard to recognize. We are trying to answer the problem by selection of customers and this is meeting with some considerable success."

A BUILDER of Machine tools, Mr. F. A. Geier, president of the Cincinnati Milling Machine Company, expresses himself as follows:

"The maker and the user of machine tools should be equally interested in seeking a reduction in the excessive cost of selling machine tools for the reason that ultimately the user pays the bill.

"Both the maker and the user have been unnecessarily contributing to the excessive cost of engineering salesmanship. The maker has been too free in offering engineering data at great cost, many times on incomplete information as to exact needs of the customer, without assurance of actual business in sight. The user, because of free service, has in many instances called for an amount of engineering data not only from one concern, but in many instances from many concerns, without giving consideration to the tremendous burden that he was placing on these concerns, and forgetting that ultimately this cost would be placed upon the user.

"Engineering service by the maker has proven itself a big factor in assisting the user to reduce cost and therefore should not be discontinued. The managements of our American business firms believe in fair play, and if the engineering service is good and the matter properly presented, I believe the machine tool user will be willing to pay for this service. Unless the machine tool industry can secure a reasonable compensation from the operation of their business, it will not have the funds for the constant development and increasing efficiency of its product, which after all the user should be most vitally interested in securing."

GENERAL OTTO H. FALK, president of the Allis-Chalmers Manufacturing Company, takes a more general view. He says: "I do not see much promise for relief in the suggestion which has been made for the adoption of a code of ethics for buyers. Such a movement would have no binding force, and in my opinion would be of little or no practical value. As a real step toward relief, there should be such modifications in the present laws as will permit of co-operation among sellers to an extent that will assist them to obtain a fair price for their products."

A MAN with half a century of experience in machine tool selling, Mr. Henry Prentiss, of New York, also thinks that present conditions are an aftermath of the war period. He goes on to say: "In recent years our industry, in soliciting prospective business, has had to deal with keen competition with an accompaniment of cut prices, and increasing wages resulting in higher labor costs. To meet these conditions specialized machinery has been designed and put into operation. This equipment has reduced manufacturing units in a large degree, so that manufacturers of standard machine tools have experienced an acute slackening demand for their products. What are conditions now in our industry? It is frequently heard that leading plants in several important classes of machine tools, have capacity to supply the demands upon the entire industry in their respective fields. What is the remedy for this condition? Will not the solution be found in the way other leading industries have solved and are solving successfully, it would appear,

the same problem? If a few men of vision, who have achieved marked success in the industry, would unite to bring relief to our industry as a whole, no doubt as favorable an outcome might be expected, as has been realized by others."

THE vice-president of a big company that builds equipment for the mechanical, mining and civil engineering fields gives some of his experiences with purchasing agents as follows:

"I know purchasing agents who never ask for bids from manufacturers whose product in their final analysis they would not consider using. I know of other purchasing agents who ask all manufacturers of the same type of equipment for prices so as to be able to offer the order to the manufacturer of the best article at the price offered by the manufacturer of the poorest article, or to secure a compromise price.

"I know of some general purchasing agents who insist that all purchase requisitions coming from their plants shall designate not less than three acceptable bids, that is, bids acceptable from a technical, engineering and quality standpoint, thus putting them in a position to force at least three bidders into final competition on price.

"As you quite properly say in your letter, manufacturers of industrial equipment, especially the larger and more prosperous manufacturers, are called upon constantly for engineering advice, in most cases months in advance of the placing of the order for equipment. Having secured the engineering advice from the large manufacturer, many purchasing agents consider that it is perfectly proper for them to use the knowledge so obtained to secure competitive bids, and very often the order is placed with a competitor who has done no work except to prepare a bid on the specifications resulting from the advice of another manufacturer. Obviously this is most unfair, and if all purchasing agents did this sort of thing we would all of us, as you say, reach the point of wholesale bankruptcy. Fortunately there are still many purchasing agents who wish to keep the respect of the manufacturers with whom they do business, but in the end they help to pay for the additional overhead resulting from the methods of the less scrupulous purchasing agents.

"Purchasing agents are not altogether to blame for existing conditions. Many manufacturers are not too scrupulous about making proposals in complete, omitting essential equipment or accessories which must be purchased later to make the plant function properly. Such tricks are not always discovered by the purchaser before the contract is placed. Many manufacturers too are careless about guaranties, deliberately over-guaranteeing performances in the belief that tests will never be made."

ANOTHER successful machine tool builder, Mr. E. P. Bullard, Jr., president of the Bullard Machine Tool Company, gives his own method of meeting the general situation. He writes:

"It is quite evident that the more competitive a particular article, the more prevalent and deepseated will be the sales expenditures for specifications, engineering and sales service. When sales competition prevails, a buyer's market is created to the disadvantage of the seller.

"I do not believe that our organization is as seriously affected by this condition as are many others in the machine tool industry; as it is our aim

1—to make a product which is as non-competitive as possible in both quality and performance, and

2—to surround the sale thereof with men highly trained and equipped with a specialized knowledge of Bullard products.

"It is our practice first to develop an interest in our products through contact with the mechanical and engineering members of an organization, and we very seldom come in contact with the purchasing division until the engineering and production divisions have obtained a practical knowledge of the possibilities of Bullard products. Thus our approach to the purchasing agent is made with assistance and interest from within."

AND another prominent New York machine tool dealer, Mr. J. R. Vandyck, puts it squarely up to the sellers. His letter says:

"The condition that you describe is something that has been brought about in the most natural way through so-called high pressure sales, and policies that are supposed to be scientifically modern. You cannot keep sellers of equipment from going after everything in sight and the free service, engineering and production estimates have reached their abnormal state by invitation of those sellers.

"So far as that 'haughty' purchasing agent is concerned, I am obliged to say that there is not as much of that in evidence as there used to be and I am very sure that all of the better buyers are trying to be as fair and considerate as their jobs will permit."

TWO other machine tool builders have much the same philosophy. Mr. L. S. Horner, president of Niles-Bement-Pond, questions "whether the industry has reached a point where any constructive change could be made in the losses incurred by an excessive number estimating on an extensive engineering design. That will come, but we are not ready for it. This same statement applies to the present practice of sending salesmen a great distance to secure a moderate size order. The correction of this trouble is in the hands, I believe, of the purchasing agent, who should select two or three only as his suppliers for a given product."

MR. W. E. WHIPP, president of the Monarch Machine Tool Company, says:

"I am a little bit afraid we are barking up the wrong tree to attempt to formulate a code of ethics for purchasing agents. To our way of thinking the best way of formulating a code of ethics for purchasing agents is for all manufacturers and sellers of industrial equipment to quote a firm price and then stand by that price.

"There is only one way, as we see it, to reduce selling expense by preventing so many salesmen of various and competing companies going on the same job, and that is by having fewer builders of machine tools. This condition will be brought about either by consolidations or by certain manufacturers going out of a field that is so very much over-crowded as the machine tool field is today."

AND now, one last word for the buyer. Another big industrial leader who has had wide experience in buying equipment from many manufacturers and also in selling them his product says that no matter how innocent, honest and well-intentioned a new purchasing agent may be, the salesmen who call on him in the first two weeks will teach him every dirty trick in the game. Which rather puts it up to the sellers to set their own house in order before undertaking the reform of their customers.

The All-Steel Automobile Body as a Manufacturing Problem

By Joseph W. Meadowcroft
Assistant Works Manager
Edward G. Budd Manufacturing Company

Present-day streamline design and large quantities make possible the use of expensive dies and extensive welding equipment

As a manufacturing problem the all-steel automobile body is one of the most difficult ones ever put up to a factory organization. In the first place there is practically no previous experience from which to seek guidance.

Early automobile body work naturally followed the traditions of the old coach builders, as to lines as well as to materials. Scroll work and more or less graceful swells and protuberances suited the public taste, educated by years of experience with similar artistic treatment of horse-drawn vehicles. The treatment was not adapted for all-metal construction. The dies required would have been too intricate. In the early days of automobile body building, transfer of skill was beginning to be thought of and occasionally talked about but little had been done to accomplish it. The need had not made itself felt at that time because there were still plenty of skilled body craftsmen to build all the bodies needed by the relatively few car owners.

At the starting end of a final assembly line where the smaller parts, doors, tops and hardware are put on

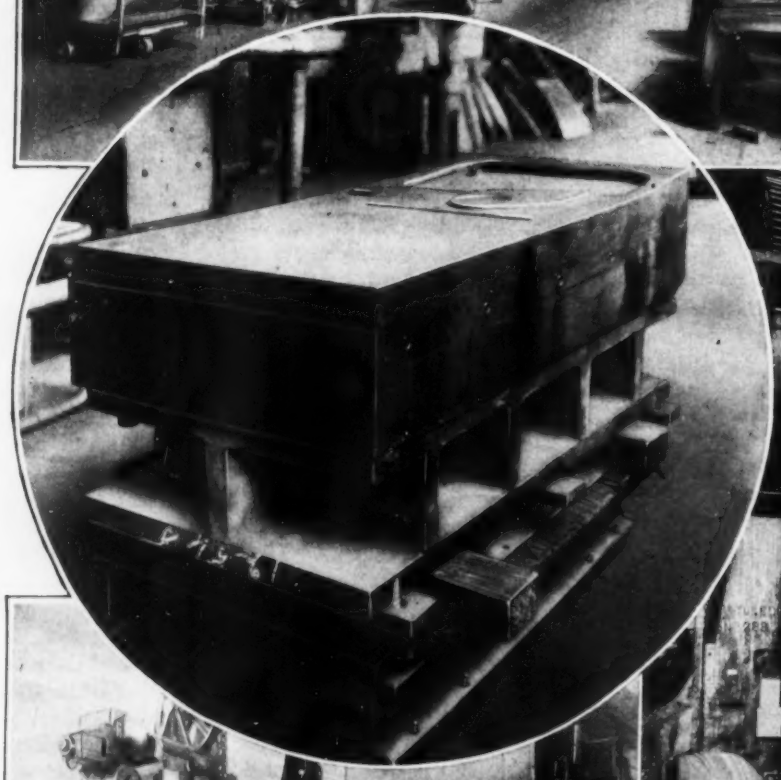
As the automobile caught the public fancy and its production went ahead by leaps and bounds it quickly left the coach traditions behind and began to develop a style individuality of its own. The world went speed mad and demanded a look of speed as well as performance. Stream-lining became the fashion and the resulting smoothing out of panels and beading opened the way for die-formed steel.

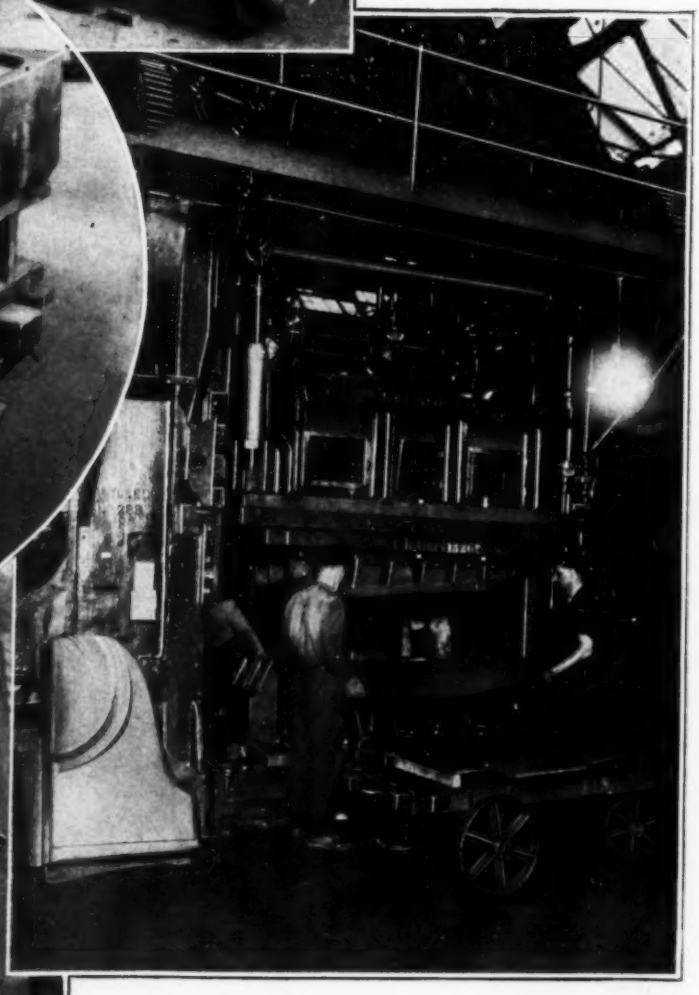
At the same time the quantity of units of a given type increased to a point where the investment in dies became economically favorable. In other words, enough bodies could be made from a set of dies before the style changed to pay for the dies and make a profit besides. Incidentally, the demand for bodies was so large that it could not be satisfied by the craftsmen available. Their methods were too slow and there were not enough of them. The only solution was to resort to transfer of skill through the press and the die. But one factor in the equation was still unknown—how to fasten the metal sections together, for rivets were obviously out of the question if outside surfaces were to be smooth. Fortunately, the art of resistance welding had finally reached the stage where it could be depended upon for large-scale production. Seam welding by gas and by the electric arc was also reliable under the hand of the highly skilled welder. The missing factor was thus supplied and the stage was set for the all-metal automobile body. So much for the early history and the underlying principles. Experience soon showed that almost every trick of modern mass production and assembly could be used in metal body building, and would have to be used if profits were to be secured.

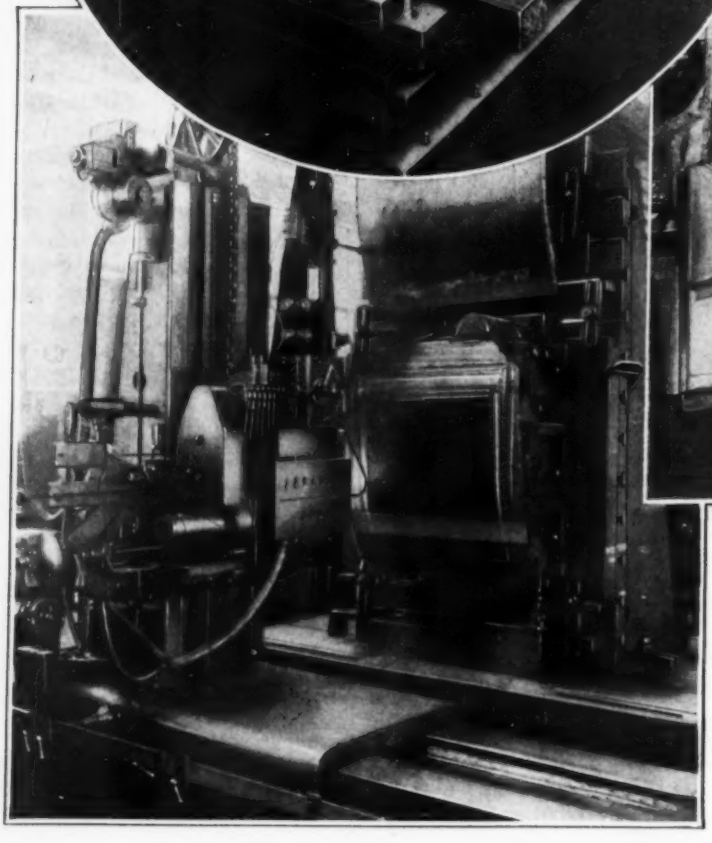
The progressive assembly line was naturally the pacesetter for the whole process. To keep up with it special-purpose automatic and semi-automatic welding machines had to be designed and built. Special quick-acting clamps to hold the flexible panels while they were being welded

A general view of one of the press departments. Stacks of cowls can be seen in the foreground

(In circle) A die used for stamping door panels. It stands on a skid ready to be transferred to or from the press on an electric shop truck







Close-up of a big press forming one section of the rear deck of a coupe

Cutting a panel die in a Keller mechanical engraving machine. The tracer tip is visible at the lower left-hand corner of the model which is above the work

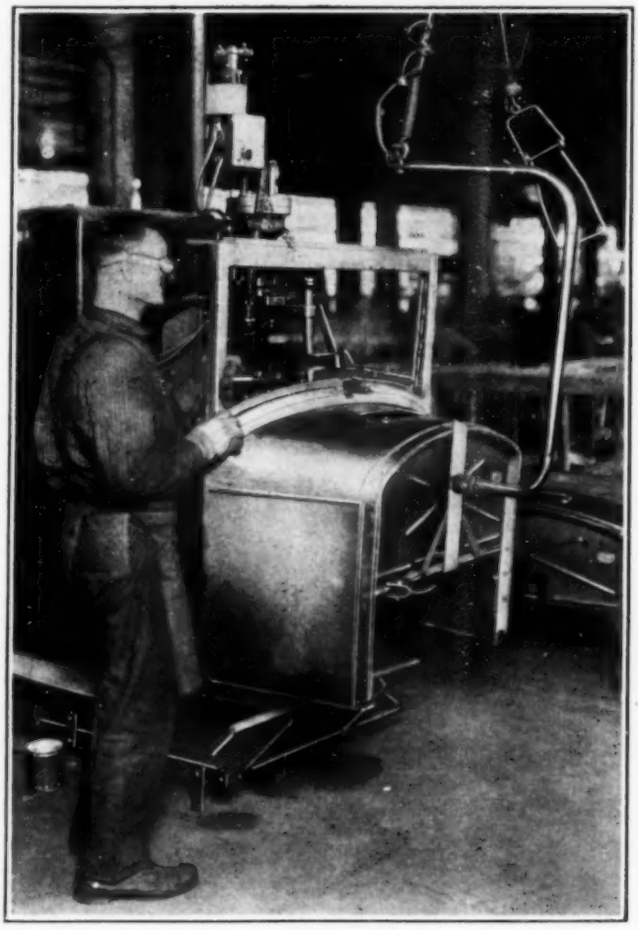
to their frames had to be devised. Jigs for lining up the various body sub-assemblies during the final assembly welding operations had to be constructed.

Inspection by traditional methods was out of the question. The bodies were too big and their outlines were too irregular. Other jigs for inspection were built, jigs that told whether the body was within specified limits, and told in a few seconds instead of as many minutes.

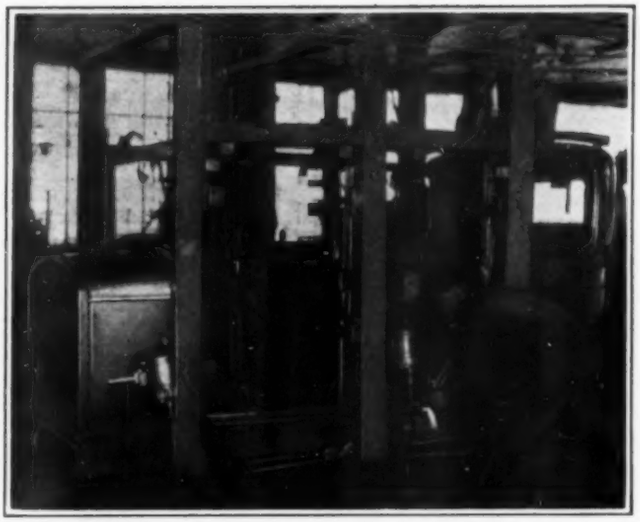
It is not easy to lick the problems that arise in connection with any large production program but the real crux of the situation lies in the fact that they won't stay licked because of changing styles in automobile bodies.

No sane engineer or production man wants to stand in the way of real progress but he can't avoid wishing that the body designers could see their way clear to putting different outer coverings on a skeleton that would retain most of its component ribs unchanged—for a year or two, anyway. Committed to new body designs each year as most of the car builders are, there is obviously no hope of avoiding annual changes in the exterior lines.

What the public wants, however, is a change that it can see and approve. With few exceptions it is not much interested with the structural details underneath. If these details could only be standardized, at least to some extent, the cost of automobile bodies could be reduced appreciably and the problems of the all-metal body builder would be greatly simplified. His equipment of dies would not become obsolete long before it wore out and his expense for tool and fixture design and construction would be materially lessened.



Spot-welding the windshield frame to the cowl. Note the unusual type of supporting bracket that carries the cowl during this operation



Assembling the various units of a body in a jig. Portable electric tools are used in large numbers and gas welding to the extent of 70 to 170 linear inches on each body

This story would be incomplete if no mention were made of material control. The Edward G. Budd Manufacturing Company is one of the largest users of steel sheets and is also, of necessity, one of the most particular customers of the sheet mills where quality is concerned.

Wrinkles, dents or rough spots cannot be tolerated in an automobile body. With the old system of painting and varnishing, minor defects could be covered up by judicious filling, rubbing and puttying, but the modern lacquers demand a perfect metal surface to start from. Instead of subduing the defects the lacquer has an unfortunate tendency to emphasize them.

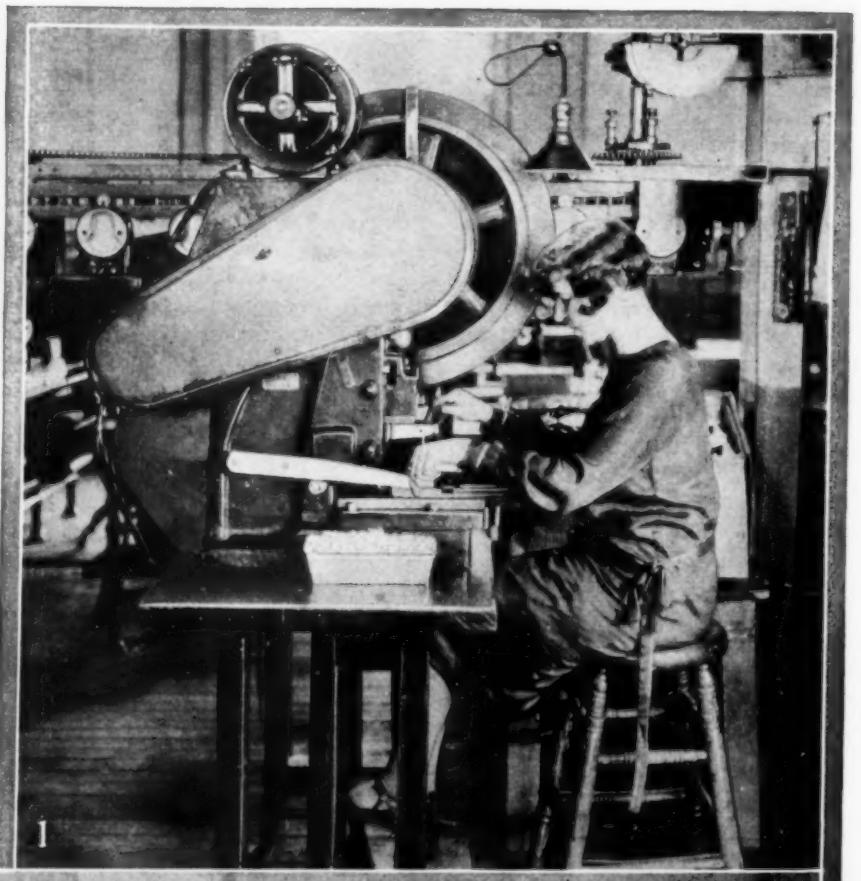
To insure getting the best possible steel the Budd Company maintains a well-equipped metallurgical laboratory under the direction of an able metallurgist who co-operates with the steel suppliers in overcoming technical difficulties. In addition a representative of the company is permanently stationed in the steel district to give the benefit of his wide steel mill experience to the production men on the job in the mills.

Research work on sheet metal forming problems is going on constantly in the laboratory. Coupled with the work of the field representative and the suggestions of the division heads in the various plant departments, this work has been markedly successful in providing the company with material that is uniform and high in quality.

There is a lot of confusion in designating the quality of steel, particularly as to the amount of carbon it contains, or the "carbon content" as it is called. It is customary to designate carbon by "points," each point being one-hundredth of one per cent. Thus a 10 point carbon steel has one-tenth of one per cent carbon, while a 110 point, or tool steel, has 1.10 per cent of carbon. Other alloys are rated by percentages, as a 3 per cent nickel steel, which was very common before chromium and other alloys came into use. It would seem better to designate all alloys in the same manner.

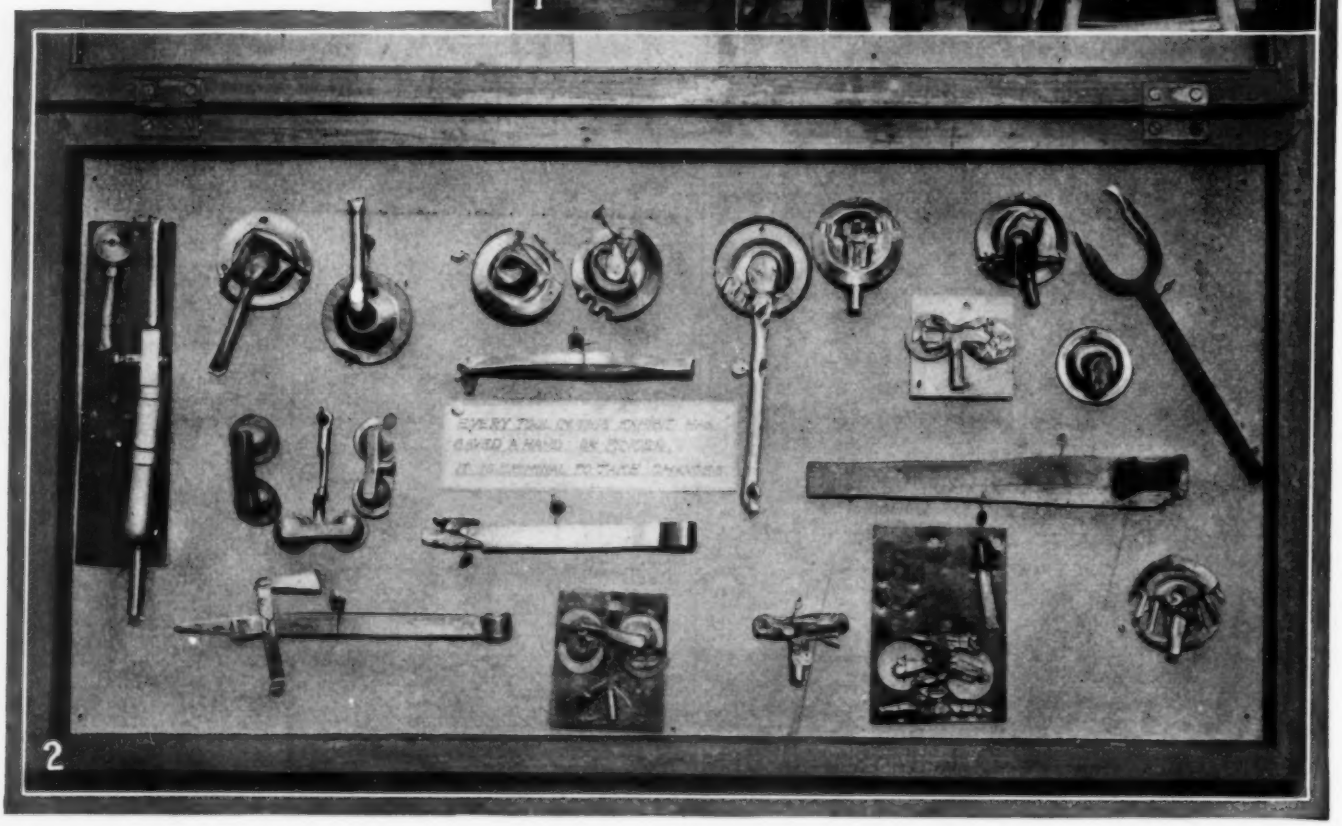
Safety in a Press Shop

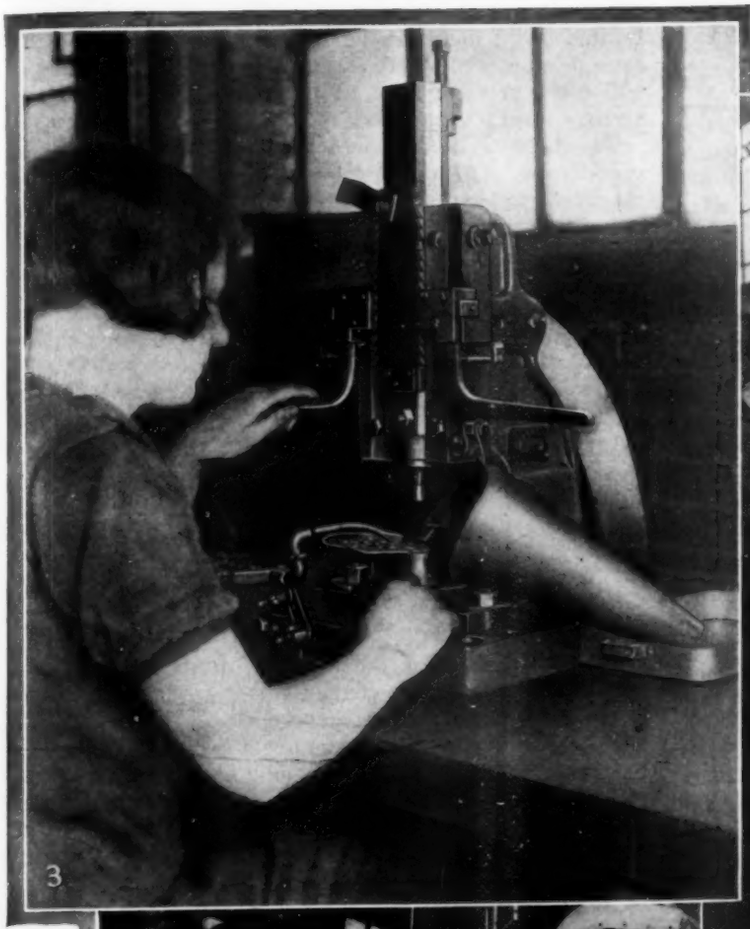
Photographs through the courtesy of the Westinghouse Electric and Manufacturing Company

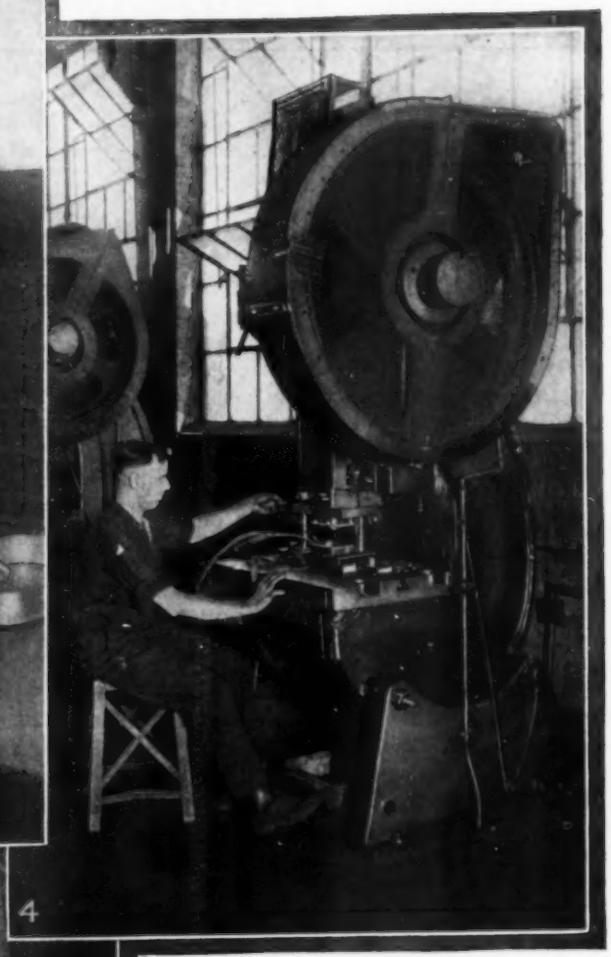


In Fig. 1 is shown a well-guarded machine having all rotating parts encased, direct motor drive to eliminate exposed belting, and double hand-lever action to keep the fingers from under the moving punch

The board shown in Fig. 2 was exhibited in the press department to promote interest in the use of safety devices. The vacuum lifting tools shown as crushed between the dies saved the operator's fingers in each case







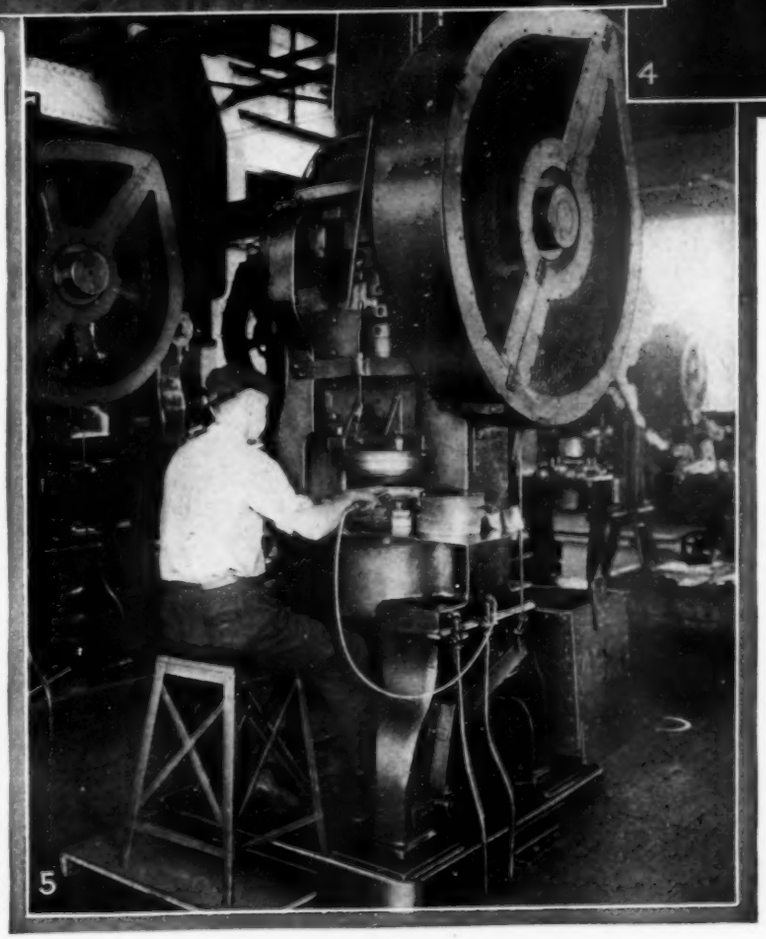


Fig. 3—A two-hand safety trip applied to a foot press. The die is also shown equipped with air hose for blowing the blank out of the die

Fig. 4 — Forming die equipped with safety feed chute and air blow-off

Fig. 5—Feeding and removing sheet metal disks by means of a vacuum lifting tool. The number of these tools caught between the dies is an indication of the number of serious accidents avoided

Book Reviews

AUDITING THEORY AND PRACTICE. By Robert H. Montgomery, the Ronald Press Company, New York. Eight hundred and fifty-nine 6x9-in. pages, cloth boards. Price $6.

THIS is the fourth edition of the work, which was originally written by the author in 1912, and which has had wide adoption and use both as a practical working manual for auditors and accountants and as a text book for students of accountancy. In the present volume, the author has added considerably to his former efforts and, needless to say, has gone over the entire work making revisions, where necessary, to bring the contents up to date.

Among the subjects treated are: The purposes of an audit, preparatory considerations, system of internal check, balance-sheet-audit-assets, inventories—rules for valuation, balance sheet audit—fixed assets, balance sheet audit—reserves, capital and surplus, the income account, consolidated balance-sheets and income accounts, auditors' reports, auditors' certificates, investigations, the detailed audit, branch audits, depreciation—rates, the liabilities of directors.

It is gratifying to find that despite Mr. Montgomery's other works, including his well-known "Income Tax Procedure" and "Financial Handbook," of which he was chief editor, the present volume does not overlap the others to any noticeable degree, as is sometimes the case when one man writes several books on the same or related subjects.

MODERN AIRCRAFT. By Major Victor W. Page. Eight hundred and fifty-five pages, 6¼x9¼ in., 97 illustrations. Published by the Norman W. Henley Publishing Company, New York. Price $5.

AVERY comprehensive book of nineteen chapters that cover various kinds of aircraft of both the lighter- and heavier-than-air types. The volume, while intended for elementary instruction, is also of interest to those who desire detailed information along a variety of lines. Theory of flight, the principles of aërodynamics as they affect both dirigibles and airplanes, and other details are given at considerable length. Among the subjects treated are: aircraft types; lighter-than-air craft; aërofoils; landing gear; power plants, both air and water-cooled; engine auxiliaries; propeller inspection; seaplanes and flying boats; commercial aviation; aircraft instruments; navigation and standard nomenclature. The book contains a mass of information for anyone interested in getting posted on aviation matters of the present day.

THE MANUAL OF INDUSTRIAL SAFETY. By Sidney J. Williams, Director, Public Safety Division, National Safety Council. One hundred ninety-seven 5½x8¼-in. pages. Cloth board covers. Indexed. Published by the A. W. Shaw Company, Cass, Huron and Erie Sts., Chicago, Ill. Price $2.50.

MUCH has been published on safety work in industrial plants since the movement began a few years ago, but the author of this book believes that a compilation of the essential fundamental information is needed for the ready reference of safety engineers, foremen, and others whose duties include the protection of workmen. In this book, therefore he has presented a text of the basic principles of safety engineering, with the idea that it will serve to solve most of the safety problems of the average plant.

The book is divided into twenty chapters and three appendixes. The author takes up first an analysis of the safety-man's job, the safety organization, and safety committees. He then devotes a chapter to the importance and place of the foreman in safety work. The methods of safety procedure are taken up in chapters on inspections, meetings, publicity, competitions, and records. The practical work of guarding machines, safeguarding equipment, and otherwise protecting the workmen is discussed in detail in several chapters. The appendix includes information on general accident records, safety codes, and sample check lists for numerous industries.

DESCRIPTIVE GEOMETRY. By Lawrence E. Cutter, associate professor of mechanical engineering, Stanford University. Second edition. Two hundred forty-four pages, 6x9 in. Cloth boards. Indexed. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $2.50.

Typographical and other errors found in the first edition have been corrected in this revised edition, and some of the drawings have been changed to make the solutions of the problems stand out more clearly. The chapter of short problems for home study has been completely rewritten and rearranged under chapter headings in the same order as in the body of the text. These short problems are supplemented, also, by longer ones for drafting room use.

In other respects the book is unchanged. The subject is presented in such a way that it can be applied directly to drafting room problems through use of the method of choosing new projection planes instead of the usual method of rotation. The theory has been reduced to four simple principles, covering one page of the book. The text illustrates the use of these principles through the detailed solution of problems, many of them occurring in the several fields of civil, mechanical, and mining engineering and architecture.

ANNUAL REPORT OF THE FEDERAL TRADE COMMISSION. U. S. Government Printing Office, paper, 6x9 in., 108 pages, free distribution. New conceptions of the part the Federal Trade Commission occupies in the commercial life of the nation have resulted in far-reaching developments. The new policies have principally to do with the idea of self-regulation in business and industry, and it has been possible to progress in these industries without overstepping the bounds of the commission's powers as laid down by law.

BIBLIOGRAPHY OF MANAGEMENT LITERATURE. Compiled by R. M. Berg, under the direction of the A.S.M.E. Management Division. Sixty-eight 8½x10-in. pages, paper covers. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y. Price $1.65, postpaid. The various divisions of management are classified alphabetically with the subdivisions also arranged alphabetically. Within these subdivisions the various articles are listed by authors arranged alphabetically. The bibiography is selective in character. It represents about 50 per cent of the material that has been published on management during the past 25 years up to February, 1927.

Progress in
Machine Shop Practice
During 1927

By L. C. Morrow

Chairman Machine Shop Practice Division, A.S.M.E.
Managing Editor, American Machinist

Presented at a session of the Machine Shop Practice Division of the American Society of Mechanical Engineers at the annual meeting of the society, Dec. 5-9, 1927

ECONOMIC factors call forth the development of methods and equipment in any industry. It is equally true that pronounced advancement in production methods and equipment design affects economic trend. It is difficult to separate the two—to say where one leaves off and the other begins. Consider that important influence upon machine-shop practice during the past eighteen months—the almost universal recognition that successful competition depends quite as much upon the use of modern equipment as upon good management. Whether such recognition has done more to stimulate design than the new products of an inspired industry have done to obtain the recognition is a moot question, and for that matter is relatively unimportant. It is enough that the recognition does exist and that the metal-working industries have the advantage of lower production costs for the user, and increased equipment markets for the builder, of modern machine-shop equipment. It is significant that sales have been few among those equipment builders who have not modernized their product from the design point of view.

Influence of Economic Factors

Similarly, there is a co-operative effect of the requirements of the equipment user and the inventive ability of the equipment builder that is revealed in more productive machines and tools with consequent mutual benefit in a business way. This condition is especially marked in connection with the automotive industry, wherein the search for ever lower production costs is a result of keen competition and the necessity for extremely large markets. It is not confined to the automobile builder, but extends firmly into any metal-working plant devoted to products made on mass production, and to a lesser extent into small-quantity, jobbing, and repair shops.

Because of the large markets required for our metal products it is advantageous that Europe is progressing toward economic stability. There have been worth-while improvements in business from England and Germany, and considerable improvement from France. Czechoslovakia remains a very good market, considering its size. South American consumption has increased. These statements apply to metal-working equipment and to automobiles.

Foreign markets are worth emphasis at this time because of the recession in the machine-shop-equipment business domestically during 1927—a recession not serious, but noticeable, and one that served to emphasize the over-capacity of the equipment shops, which has resulted in the extension of the lines of individual builders, thus multiplying the points of competition. To offset such expansion there have been few consolidations.

Other general factors affecting the metal-working industries are hand-to-mouth buying, increased commissions to dealers in some divisions of the industry, the requirement for sales engineers who are skilled in processing, the necessity for more accurate cost-accounting methods, and progress in standardization.

Hand-to-Mouth Buying

Hand-to-mouth buying has reduced inventories in some quarters and increased them in others. It has benefited the equipment builder in that respect, but has, at the same time, placed the premium of getting the business upon the ability to make prompt delivery. Thus the manufacturer with few lines and still fewer variations has had an advantage.

Increased commissions to dealers have raised the cost of sales, but have also spurred the dealers to increased efforts. Moreover, since not all of the increased cost could be passed to the consumer, on account of keen competition, the equipment builder has found it to his advantage to look to his own methods and equipment.

The demand for sales engineers skilled in processing is a natural outcome of the search for better methods compelled upon the part of the user by competition.

More accurate cost-accounting methods must necessarily accompany campaigns directed at the lowering of costs. Despite the fact that in principle, modern equipment has decided advantages over equipment several years old, there are cost-accounting problems that must be solved to the satisfaction of the guardian of the purse strings. For example, how much shall be allowed for depreciation and how much for replacement in view of the evident shorter economic life and increase in cost of equipment of advanced design, greater productive capacity, and better quality? This matter of cost accounting has assumed such large proportions that equipment builders are actually undertaking to educate equipment users in its fundamentals.

Standardization, not alone in metal products but in entirely disconnected lines, has influenced machine-shop

practice. We are in an era of standardization and simplification that is reflected in all products. It is bound to have—and has had—an appreciable influence upon methods and equipment. The progress in the field dominated by the machine shop has had some notable examples of successful standardization. Akin to this movement and to the process of simplification is the elimination of waste, the outstanding results of which are already known, but which is being carried further by reductions in the cost of product by the substitution of pressed-metal and welded parts for those formerly made by more expensive methods.

Progress on Changes

Most of the progress in machine-shop practice is indicated by the changes in machine tools. The first machine-tool exposition under the National Machine Tool Builders' Association, held in Cleveland in September, was therefore an index of such progress. The exposition was important also as further establishing a delayed buying period that had already become noticeable as a result of the expositions of the American Society for Steel Treating. The exposition of this year was the largest collection of machine tools featuring new design—and under power—ever displayed. Its influence upon the designing engineers of the builders and the production engineers of the users was most pronounced. It was a mart as well as a display. It thoroughly impressed the users of machine tools as to the extent and the solidarity of the machine-tool industry and doubtless served to convince the machine-tool builder anew of the importance of his industry to civilization.

Progress in machine-shop practice, aside from the generalities just dealt with, can be shown best by a consideration of the details of changes in design of machine tools.

The demand of the machine user for greater strength, greater rigidity, and constantly higher speeds of production has been met by the builder with increase in weight, strengthening of critical sections, and a substitution of sturdier materials, especially in the more universal use of heat-treated alloy steels. Though the removal of great volume of metal is not of necessity a part of modern high-production methods, the ability of a machine to do so is, in a measure, a test of its capacity to withstand the shocks of high-pressure work without lowering its standard of accuracy and precision.

Use of Anti-Friction Bearings

Anti-friction bearings have been incorporated extensively into the design of machine tools on rotating shafts, and in some cases on spindles, particularly on the spindles of drilling and grinding machines. Even on milling machines their use is quite common. At least one lathe builder uses them regularly on the spindle, and another supplies them as optional equipment. No standard practice in the application of anti-friction bearings has appeared. Some builders use only ball bearings, others only roller bearings, still others use both. On many machines the plain bearing has practically disappeared.

It is becoming more common practice to connect the rotor shaft of the electric motor direct to the first driving shaft of the machine through some form of compensating coupling. In many of the machines having movements of adjustment in several directions a corresponding number of motors is used, each motor driving the particular unit upon which it is mounted without reference to or connection with the other parts of the machine.

The unit-drive method has led to the wider control of power traverse and power setting by push button, a control that has been developed to a point of great precision. Electric clamping, controlled by push button, also has been adopted when practicable, particularly for clamping the columns of radial drills.

In spite of the growth of the method of driving through direct connection of motor to driving shaft, the method of transmitting power by means of a short belt or some form of silent chain remains the most popular. It permits considerable latitude in the matter of speed ratios, works well upon even very short center distances, and operates without noise. A check-up of half of the machines at the machine-tool exposition showed that approximately 57 per cent were so driven. Another drive suitable for short center distances, and finding favor, is the multiple V-belt type. There are now several applications, and the indications are that its use will increase.

While the automobile-type disk friction clutch is more generally used, there exists a difference of opinion, some designers tending toward the positive clutch.

One of the greatest advances made has been in positive lubrication. In many machines all important bearings are oiled from a central reservoir by means of force-feed pumps. Both the circulating system, in which a continuous flow of oil to the bearing and back through a filter to the reservoir, and the intermittent system that supplies a drop of oil to each bearing at stated and easily regulated intervals, are used. Flood lubrication is rather generally applied to gear boxes. Pressure-gun greasing is used on many tools for isolated rubbing points. Full force-feed oiling of a whole machine has been accomplished; either a circulating or a "one shot" system is used for the purpose. An oil purifier, of the type used on automobiles, has been applied to at least one make of machine.

The hydraulic medium for transmitting power has been adopted to a surprising extent. It has been applied to the auxiliary feed and traverse movements, where it is of especial value because of its flexibility, easy control, and low liability to derangement and breakage. Particularly rapid strides have been made in applying this type of feed to drilling machines, grinders, and broaching machines, although other types, including milling machines, have been so equipped. Of the two hydraulic drives in common use, the cylinder-and-piston type is the more frequently applied, although in some of the larger machines, having long traverse movements, a hydraulic motor is connected directly to a pinion in mesh with a rack on the moving part. In this way there are no limiting factors in respect to length of movement inherent in the drive.

Developments in Design

Other developments that apply to the machines of individual type, or to the machines of individual builders, can be described sufficiently by name only:

The actual and contemplated adoption of hardened steel ways.

The increased use of interlocking devices on control mechanisms.

The increased use of safety devices, shear pins, slip frictions, and similar devices.

Changes in planer control to secure more rapid acceleration.

Dynamic braking on voltage control.

Further trend toward automaticity.

Use of progressive assembly in building large machine tools.

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Increased use of grouund taps and very accurately finished chasers.

Contour planing and turning, using thin sheet templets, and with automatic electric control of the tool.

Cold-rolling of thin sheets and strips, by means of rolls of small diameter, without annealing.

Development of machine tools used particularly in the automotive industry deserves special mention, because of the influence of the industry upon machine-tool design in general, and because the automobile industry furnishes the greatest single market for machine tools. The developments have not been startling, in the way of new processes of a revolutionary nature, but changes have been constant, all tending in the direction of increased production and improved quality.

In machines such as the knee-type miller, there has been adaptation of the standard machine to special uses by means of additional spindles at whatever angle or in whatever position fitted the particular job in hand. In a somewhat similar way the special drilling head, with its spindles built to handle a particular job, and that job only, is being used in place of large multiple-spindle machines in which the spindles have to be adjusted for each set-up.

For certain types of drilling there has been considerable development along the line of three- and four-way drilling machines with enough spindles to drill all the holes in a transmission case or similar unit.

Turret lathes, both hand-operated and semi-automatic, are being more widely used. They have been improved by being provided with more substantial spindles and bearings, more convenient controls, and better lubrication.

The use of the grinding method of machining continues to increase, being particularly noticeable in connection with flat work and in honing. There is a noticeable tendency toward the adoption of the rigidly mounted hone, with the object of correcting out-of-roundness and taper. The latest types of machines on which the rigid honing heads are used provide automatic collapse and expansion of the heads. Originally designed for and used in the finishing of cylinder bores, the rigid-hone head is now being applied to the finishing of smaller holes, one example being piston-pin holes less than one inch in diameter.

A late addition to the line of crankshaft machinery is a lathe in which the shaft can be driven from the center while both ends are turned. A bearing is used between each two throws of the crankshaft.

Advancement in Grinding

Outside the automotive field, as well as within, the grinding process has been making great headway. New abrasives and new types of wheels have done much in the way of production. New bonds have permitted greatly increased speeds. Grinding of machine ways is an accomplished fact. Spindles are being subjected to an extra-fine grinding operation that gives a surface comparable to the best in automotive practice; considerably longer life is expected to result. Semi-automatic and full-automatic machines that put the work in place, perform the operation, and pass the finished piece on to the next machine are coming into the grinding field. In line with the general trend, more attention has been given to securing accuracy with a minimum of the operator's attention, even within remarkably close tolerances. Centerless grinding has made great strides, both in machine design and from the point of view of increased knowledge of the possibilities by the method. Semi-automatic, multiple-spindle, cylinder grinding has been developed. Worm-grinding machines have been introduced. Segmental grinding-wheel chucks have been placed on the market.

Certain processes and certain types of machines have come to the front during the past year.

Arc welding has been developed to the point where it is making possible the use of structural shapes and slab steel instead of cast iron and steel for motor and generator parts, for machine bases and for other products. Hydrogen-arc welding has been introduced as a practical process, and the shop equipment for its use has been developed. Welding machines as a whole have been developed, so that the process is much less dependent than formerly upon human skill, thus placing the process within the positive group, adaptable to production.

Jig-boring machines have been much improved during the year. The advances in design have been very favorably received, and in spite of prices relatively high in comparison with those of other kinds of equipment, have found a ready market. Their advent has placed many older and less accurate machines in the obsolete class.

New Gaging Methods

A new method of dimensioning chamber sizes in rifle barrels and a standard method of making and checking chamber and barrel gages within 1/200 of 0.001 in. have been discovered. By the use of this method duplicate chamber plugs may be made by several gage makers, without variation among the gages of more than ¼ of 0.0001 in. in diameter and with a variation of 0 in length.[1] It is obvious that these methods may be applied to gages for other classes of work, and may be instrumental in obtaining the extreme accuracy toward which the machinery industries are tending.

The casting of locomotive frames with cylinders integral by a middle-western manufacturer has given rise to a need for large machine tools to finish these castings. To perform the necessary machining there has been built a large milling machine to perform in one setting the operations that formerly required a large planer, a large slotter, and a cross-cutting planer. The redesign has effected a material saving in cost.

Equipment for producing accurate gears has progressed in design. The process of burnishing after cuting, and sometimes after hardening, is prominent. Additional equipment for inspecting gears also has been made available. One manufacturer has devised a machine for inspecting a gear and at the same time making a record of any inaccuracies, which can be analyzed to determine the characteristics of the gear.

Finishing of machine tools, other machines, and miscellaneous metal products is undergoing development. Finishing of machines by the spray method, usually involving the use of lacquers, has been adopted by several manufacturers. To some extent conveying equipment has entered into this process. The anodic oxidation of duralumin is one of the new finishes used on products.

The processes involved in heat treating have received marked attention during the year. Certain nomenclature has been adopted as standard. Time and temperature control has been made more exact. Steels and their treatments have been improved. Among the hardness-testing instruments introduced is one that measures the load required to cause a diamond ball to be impressed a given and constant distance into the material being tested, with provision for correction for errors due to contrac-

[1] A demonstration of this method was made by E. Pugsley at Frankford Arsenal and in New York City before the Technical Committee of the Sporting Arms and Ammunition Manufacturers' Institute.

tion of the parts in the machine and the diamond when under strain.

Among the individual machines introduced during the year that point the way to what may be expected are:

An "offset" milling machine, making use of a circular table on which the parts being milled surround a cutter of large diameter, the centers of the cutter spindle and the table spindle being eccentric. The object of this design is to engage a large proportion of the cutter with the work.

A push-broaching machine for broaching flat surfaces usually milled.

A turret lathe that has an ingenious hydraulic chuck-operating device actuated by the coolant pump, and using the coolant as the liquid medium.

An automatic vertical turret lathe.

Standardization

Standardization, though influential, did not progress as rapidly as it should have during the past year in the machinery industries. The outstanding accomplishment was the standardization of spindle noses and arbors of milling machines. Aside from its value as providing standards, it demonstrated what can be done in standardization work by an industry or group.

T-slot standards, adopted during the year, were heartily welcomed. Their full effect will not be felt for some time.

Other standards have been adopted, and progress has been made toward the determination of still others. Announcements from the committees and societies concerned, and by the technical press, have kept those interested informed.

Partial standardization of the principal dimensions of a.c. and d.c. motors has been accomplished in foreign countries. To some extent individual domestic manufacturers have progressed along the same line, making certain dimensions constant for a.c. and d.c. motors, but as a group the motor manufacturers have done little.

Of research work within the industry, there has not been a great deal. Progress reports issued from time to time have given information concerning the work on gears being conducted at Massachusetts Institute of Technology under the auspices of the American Gear Manufacturers' Association and The American Society of Mechanical Engineers. Studies have been in progress concerning oils and cutting tools. Study of dynamic and static balance has resulted in widening the field for balancing equipment beyond the balancing of automobile cranks and flywheels to the rotating parts of all kinds of machinery.

The activities of the Special A.S.M.E. Research Committee on Mechanical Springs during the year covered the organization of a financial co-operative group, the preparation of the bibliography for publication, and the layout of experimental work for the year 1927-1928. The personnel of the financial group numbers forty-five, twelve of whom are spring manufacturers and the remainder spring users. Each of these firms contributed an average of about $150 to the research fund. The committee is now starting the experimental phase of its program, several candidates for the position of Research Fellow, who will conduct the tests, having been interviewed. Copies of the bibliography will soon be available.

It is hoped that more will be accomplished by research during 1928. A committee for the purpose of instigating projects for research has been formed by the Machine Shop Practice Division. Machinery has been provided for getting the work under way after the committee has made its recommendations as to the work to be done, the laboratories available, and the personnel desired. It is expected that the value of the results to be obtained will then be so evident as to greatly assist in the collection of funds.

No one can predict with certainty what will be done during 1928. We may expect, however, to see progress along several lines, among them:

Still further use of hydraulic feeds and drives, anti-friction bearings, heat-treated alloy steels, pressed-steel and welded parts, automatic lubrication, safety devices, and automatic operation.

Development and adoption of more standards—for example, standards for nomenclature, initial machine speeds, motor speeds, electric-motor mounting dimensions, machine-tool capacity and performance, belt pull, and so on.

It is likely that foreman training, already well to the front, will be a subject of both experiment and progress during the coming year. It is gratifying that the foremen themselves are realizing the importance of their positions and are making persistent efforts to better fit themselves for their work.

There is still a feeling on the part of some members of the industry that skilled mechanics are no longer being made in quantities sufficient for the good of the industry. Other members feel that the supply is keeping pace with economic law—that the transfer of skill from man to machine has made relatively few mechanics necessary. No matter which viewpoint may prove to be the better, it is essential that the industry train boys for shop positions. From the ranks of these boys there will always emerge a number of skilled mechanics, who can be at least a nucleus on which to build in case of emergency. Others of the boys will become foremen. All of which indicates that attention should be given to apprentice training. There should be devised a system that will cause each manufacturer to contribute his share of skilled workmen and foremen to the industry.

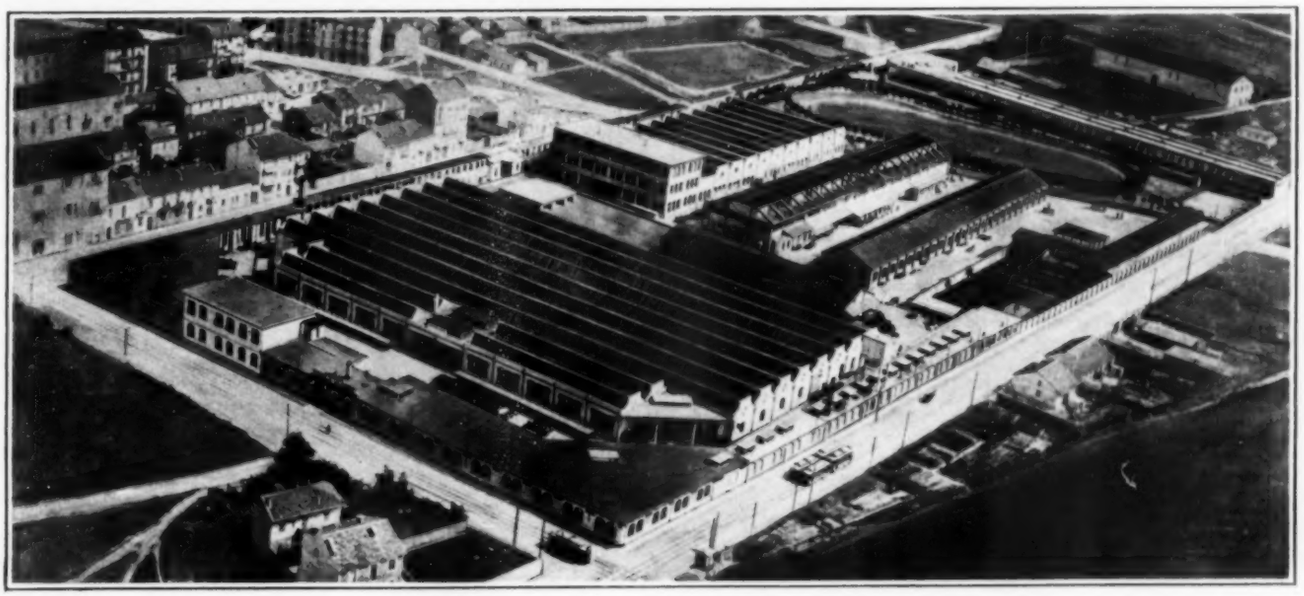
There are predictions that at some time in the future we may expect radical improvement in cutting tools, an improvement which will cause the new tools to be so much more productive than those of today that the increased production will be comparable to that resulting from the introduction of high-speed steel. Whether such improvement will appear during the next year or within the next few years, is conjectural. The advent of a material, or a process, that would have such an effect would revolutionize machine-shop practice.

Why Not Use Hydraulic Drive for Planers?

By Martin H. Ball

THE abstracts of the A.S.M.E. annual meeting papers were of very much interest, particularly those relating to hydraulic feeds. This type of feed bids fair to occupy an important place in the make up of the "Master Tools of Industry."

Why not go a step further and apply the hydraulic drive to planers? Would it not have many advantages? I believe we might expect the following: smoother and more quiet action; more accurate stoppage at the beginning and ending of the stroke, thus allowing machining to be done closer to a boss or obstruction of any kind with less risk of injury to tool or work; reversal with less shock; and an almost limitless range of table travel.



Airplane view of the Lancia engine department

Features of the Lancia Plant and Organization

By J. A. Lucas

TWENTY years ago, when the automobile industry was still young, Vincent Lancia started the factory that now bears his name. Aiming at mechanical perfection and comfort for the user, rather than at the production of cars in large quantities, each detail of construction naturally received more careful attention than is possible where a product is to be manufactured to sell at a limited price. Although building for a limited market, the growth of the plant has been steady and now covers an area of about 240,000 sq.ft. and employs 2,500 people.

In spite of his success, Mr. Lancia still retains personal control of the plant, both in technical and administrative lines. So great is his tenacity of purpose that once he conceives an idea for improvement, he clings to it until repeated tests convince him that he is on the wrong track. These tests frequently disclose ideas and devices that add much to the ingenuity of design found in the Lancia car, some of which will be described in later articles. Some of these ideas have made the Lancia car unique.

There is no complicated system of executives or management. Mr. Lancia deals directly with his shop superintendents and holds each responsible for the results obtained in his department.

Each department has a superintendent, a general foreman, and several head workmen, the latter being held responsible for the quality of such important parts as crankshafts, connecting rods, cylinders, etc. Each department is practically independent and has its daily program of production. The department foreman is responsible for the machinery, material and personnel, and has full power under the superintendent. The duties of each executive are clearly outlined.

Every morning Mr. Lancia receives a short report from each superintendent and general foreman, each giving a brief account of his work and receiving his orders for the day. The superintendent and foreman confer as to facilitating the work and then return to their respective departments. All verbal statements made at the meeting are put into writing as soon as possible in order to avoid any doubt or confusion later. Instructions are made definite. Time and costs on previous jobs are always available by the statistical department for comparison purposes, so that past and present production costs can be readily compared.

The purchase and storage of materials receive careful attention. Money is saved by regulating purchase to keep pace with consumption so far as possible. Jigs and

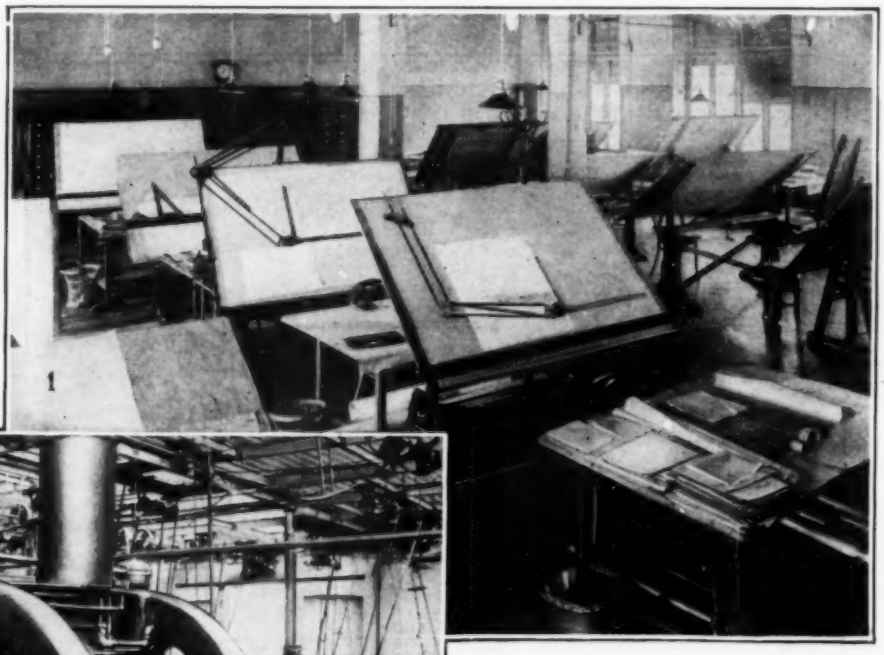


Fig. 1—Engineering department and drafting room. Drafting machines and the type of tables in use are to be seen in this view. Note the individual lights over each drawing board and the reflected illumination from the ceiling

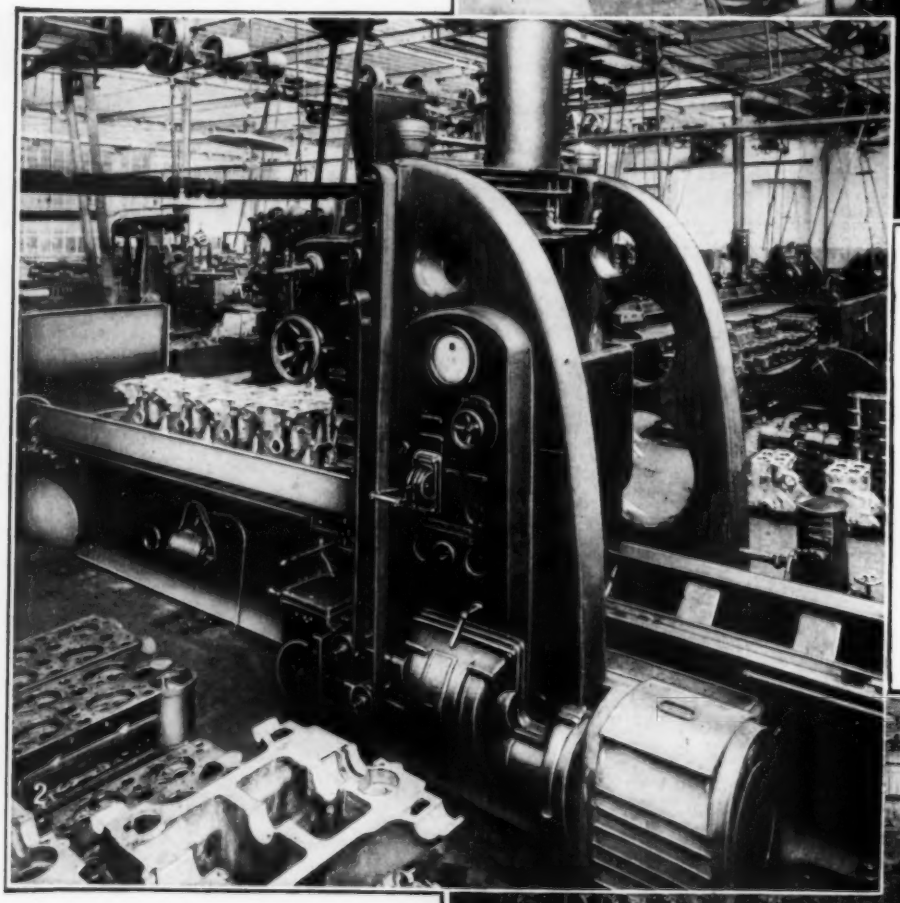


Fig 2 — Large, planer-type grinding machine for finishing the surfaces of cylinder blocks. The power consumed by this machine is indicated by a wattmeter built into the machine. The department is heated by overhead radiators having circular ribs

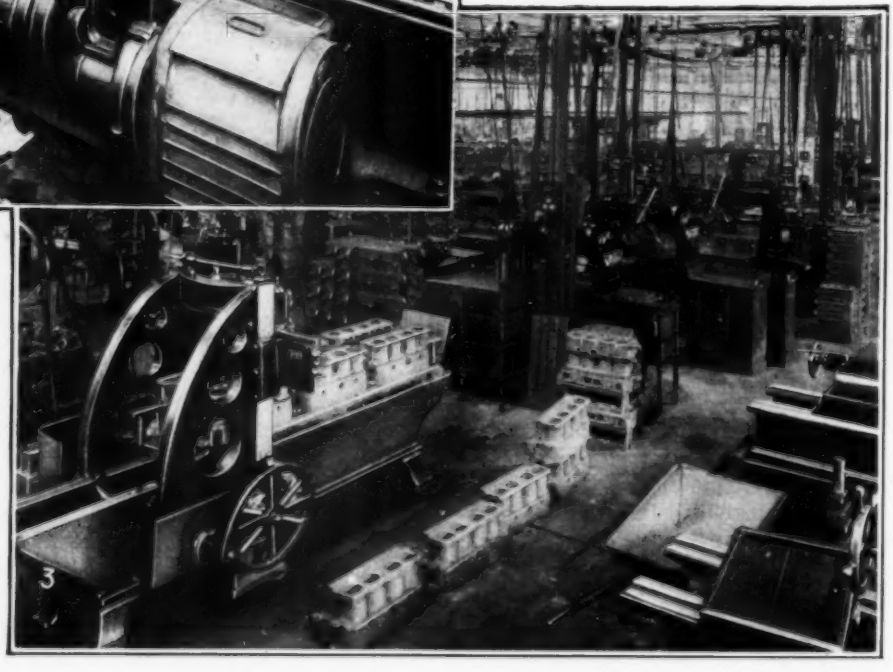


Fig. 3—Straight-line cylinders being planed on their mating surfaces. This method is in marked contrast to that employed in plants where the production is large

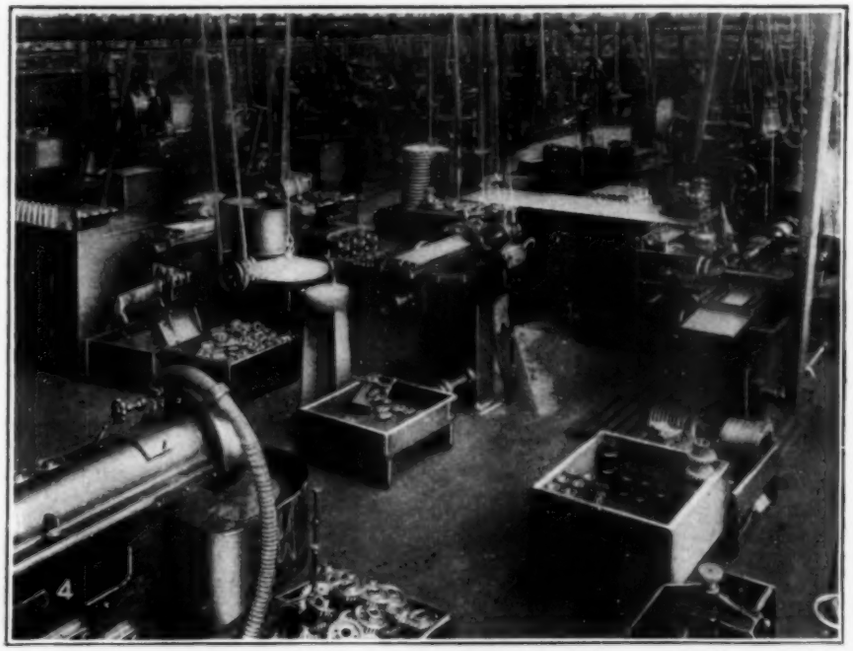
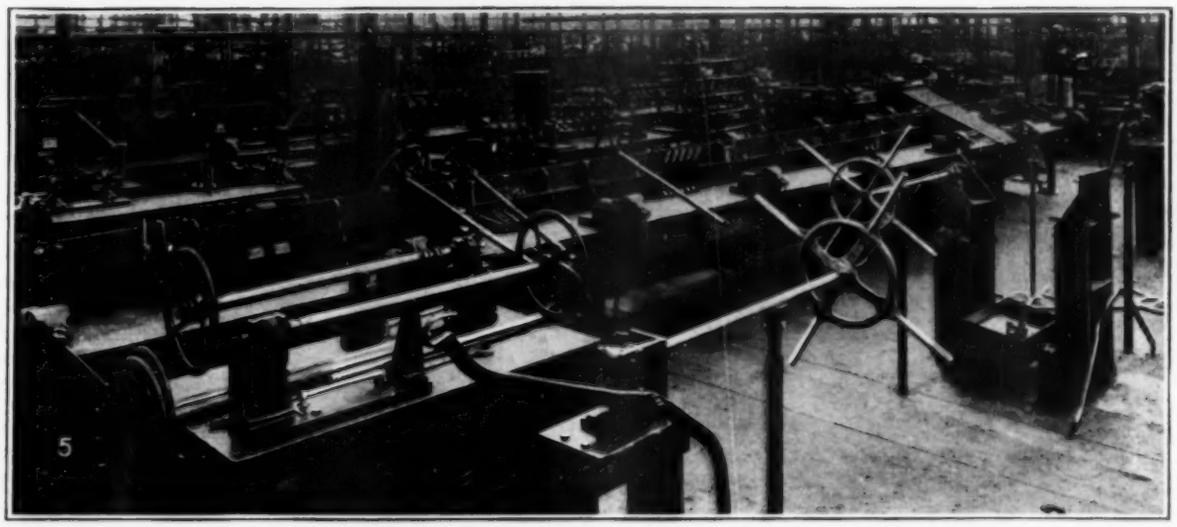


Fig. 4 — Gear-cutting department for spur, straight-bevel and helical gears. There are some grinding machines in this department, on which the faces of gears are ground

Fig. 5—One of the fitting departments showing the type of benches and the equipment in use. The steering gears in the foreground are being worked in. The running condition of the worms and gears is indicated by feeling



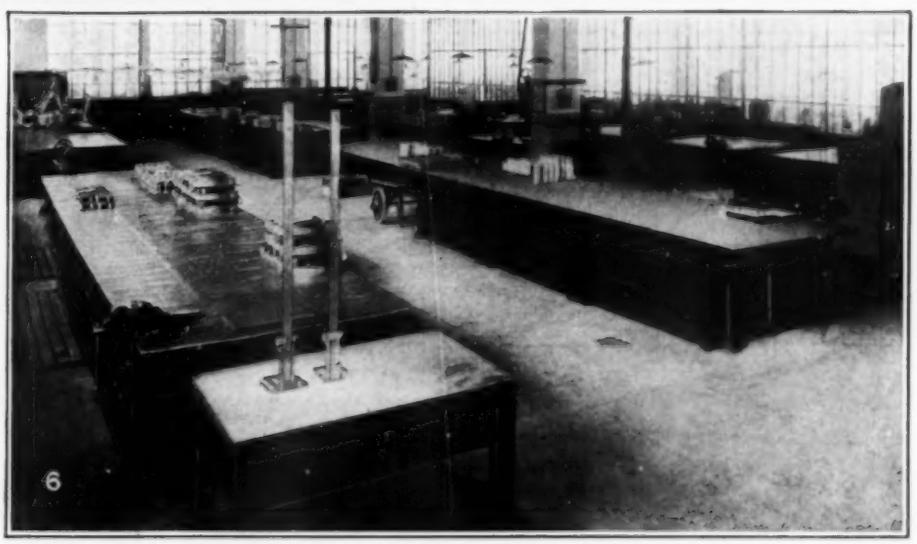


Fig. 6 — The final inspection room for finished products. A very complete equipment for inspecting and checking all finished parts is contained in this department

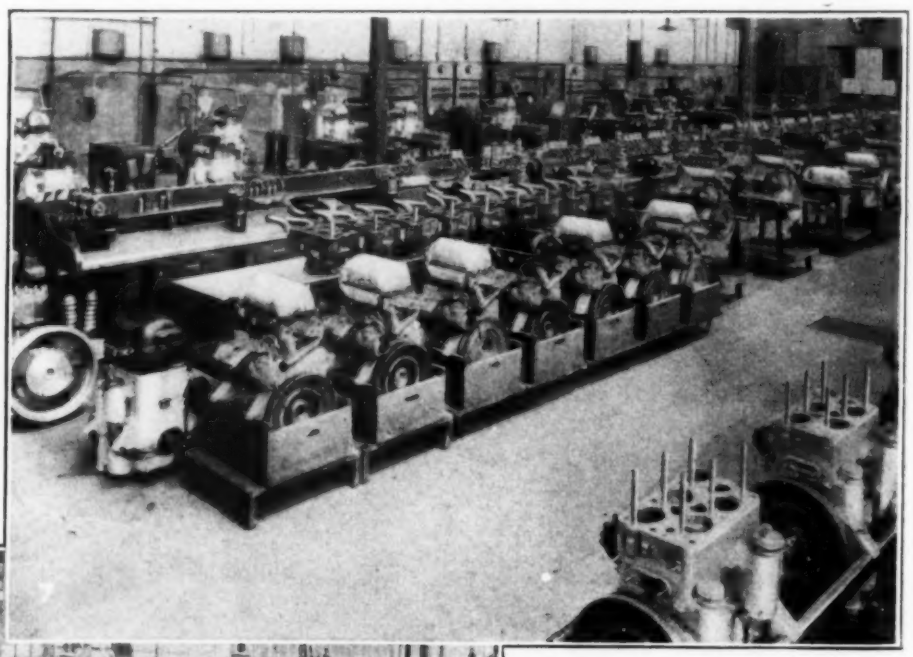


Fig. 7 — Assembly and test room. The engines in the foreground are ready to receive the cylinder heads. Those in the center are ready to be tested, while the ones against the wall, at the left, are undergoing the running test

Fig. 8—Parts gathered for assembly. Beginning with the connecting rods, at the left, there are crankcases, cylinder blocks and other parts ready to be assembled in the aisles at the right

Fig. 9—Workmen's club house and athletic field. Every day after working hours and on holidays, the attendance at this place of recreation is very large

fixtures are designed, built, inspected and delivered to the foremen ready for use.

Suggestions for the betterment of either the plant, the production or the product are encouraged. All such suggestions are forwarded to a special department and all are answered, with comments as to their utility or lack of it, and the reasons given. When found useful, the reply is accompanied by a cash bonus or prize. The suggestion system has proved very successful, not only with direct reference to production, but also in disclosing those who have ideas and initiative. One department controls the movement of material to all other departments. Its schedules are based on sales requirements and on the morning conferences of department heads. Its function is to see that the necessary material reaches each department in time to meet its schedule. This control extends to all units and to sub-assemblies. Inspection begins with rough material and is carried on throughout the entire manufacture. Units are also inspected before sub-assembly and again when the assembled units are mounted in the chassis. Parts that are affected by changes in temperature are inspected in rooms heated to a standard temperature. The inspectors are especially trained for their work by a superintendent, and their inspection is very rigid. Anything that does not come within the limits set by Mr. Lancia must be discarded, whether it be a single piece or an assembled unit. Tolerances are set very carefully and are strictly adhered to. As an example of the close touch Mr. Lancia keeps on the output, he makes it part of his daily duties to drive a newly assembled car on the road, and in this way keeps a personal contact with the product being turned out day by day. A decided novelty found in the Lancia shops is the 6-page daily newspaper. It contains news and information relating to all departments, and is delivered to the desk or locker of each employee one hour before starting time. The paper contains an outline of the production problems of the plant. It points out the needs of each department, gives the surplus material if any, tells about new machinery, changes in shop personnel or methods, and keeps every worker in the plant posted as to his department and also as to the whole plant.

Vincent Lancia
Founder and President

F. Pallavicini
General Superintendent

And the paper is read. For each employee is questioned frequently concerning various articles or statements that have appeared in it. These questions are not confined to the news, but are also asked regarding different phases of the work in the plant. This necessitates each man reading the paper regularly. The whole plan has worked out well, both as to securing the interest of the men and as an aid to efficiency.

Special loose-leaf bulletins are issued to the foremen and to the workers, by the department superintendent's secretary. The bulletins cover rules of various kinds that are enforced in the shop. They include discipline, length of service, rules of a technical nature, and also general rules. All are more or less ironclad and of a military nature that must be obeyed without comment.

Workers are divided into several classes. Men who prove themselves more proficient than the average are given a higher grade of work and better pay. They naturally strive to get into the higher classes, thus developing initiative and, at times, executive ability. Draftsmen, tracers, layout men, inspectors, and operators on highly specialized machines are in the higher classes. Before a worker can get into one of the higher classes, he must be recommended by the shop superintendent. And before advancement can finally be made, he must have proved his worth by four successive weeks on the work of a higher grade. Neither a foreman nor a head worker can offer or suggest advancement of a worker, this being the sole prerogative of the superintendent. Should a worker in the upper class fail to perform his work satisfactorily, he may be either demoted or laid off.

A bonus, or premium, is also given to workers who are particularly worthy. It may be given for good conduct and dependability, increased production, better quality of work, or for other reasons. Bonus, for whatever cause, is paid monthly.

Shop bulletins are circulated frequently. They are clear in tone and leave no doubt as to their meaning. It is felt that they aid in maintaining discipline and in increasing production. Naturally all try for the bonus, because it means an increase in compensation that may be used for any purpose desired.

New Automotive Developments

THE automotive industry, owing both to its development as a new industry and the large demand for its product, has had a tremendous influence on all manufacturing. Not being handicapped by tradition or by old plants, it picked the best machining methods available, improved them in many ways, and gave them every opportunity to develop in new plants designed especially for automobile production.

Demand for large outputs made possible the development of new machinery, as well as methods that have increased accuracy and decreased costs to a degree that would have seemed impossible even a decade ago.

Another important development is taking place at present. It is a combination of real vision with new machines, new gaging methods and new ideas as to close tolerances that are possible in mass production. Tolerances that were almost unknown ten years ago, even in toolroom work, are now being demanded of production machines. The result is easier assembly, better running and longer life for the mechanism.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Should the Super Talk to the Men?

"SAY, Al, I don't just like the way Williams comes into my department lately and talks to the men."

"Just what does he do?"

"Nothing much, exactly. He chats a few minutes with Jones on the boring mill, or Bricker on the planer. Asks them how things are going; how the tools are standing up in the castings from the new foundry; and a few things like that. Looks like he was either trying to get a line on whether I'm doing my job right, or else he's bitten with this 'big brother' bug. Can't say I just like it at all."

"Doesn't give orders over your head, does he, Ed?"

"Not a bit. I'd kick a lot if he did. Just seems to want to get a line on the men, see if they take an interest in the job, or ask after the folks, or something. He didn't used to do it, that's why it seems funny and makes me a bit leary. Has he been around your department too, Al?"

"Of course. Don't flatter yourself that you get all the attention. But I rather like the idea, Ed. Seems to me the super ought to know the men a little better than most of them do."

"But it looks like he doesn't trust us, Al. Why can't he ask us about any man he's interested in?"

"You're finicky, Ed. Williams wants first-hand information. He wants to know what kind of men he has to pick from if he needs a new foreman in a hurry. Suppose our train went in the drink going home tonight, and we joined the mermaids. Williams would be minus two darn good foremen and he'd want to know if we had any men who could take hold of the job. Couldn't ask us, could he? But, if he has an idea from personal contact that Jones knows the job and can handle men, he's all set to give him a trial.

"I think it's a good hunch, Ed. Just as I think the G. M. would do well to get to know us foremen a lot better than he does. There's a lot to be gained by knowing a few men in the shop besides those directly under your wing."

Is Ed right in thinking that all contact should be through him? Or does Al's idea as to Williams' reasons seem likely? How far can such personal contact go?

All foremen are urged to discuss these questions. Acceptable letters will be paid for

Discussion of Earlier Topics

Foremen as Inspectors

IT IS generally understood that the primary function of the foreman is to produce quantity production, and the function of the inspector is to maintain quality at the prescribed standard. But, it is also true that the foreman must produce the quantity to definite specifications, and this automatically causes his duties to overlap those of the inspector. However, if the view is taken that the function of the inspector is to check the foreman's oversight of defective material rather than check the individual operator, it is evident that foreman's responsibilities, and hence his usefulness to his organization, become greater. After all, the foreman controls the facilities to produce quality, and the inspector only maintains it after the operation is completed.

—M. STERN.

THE foreman should be the manager of his department, and should be held responsible for the efficient management of it. Most foremen pay too little attention to the work while in process, especially to the maintenance of the tolerances. Too often the foreman leaves this up to the inspector, which generally results in an unnecessary expenditure for correction of defects, or the scrapping of work. If the inspection department issues a report of defective work, stating the defects, and the report is sent to the superintendent, it will not be long before the foreman corrects the condition which caused the scrap.

—S. W. SULLIVAN.

A FOREMAN who has a responsible attitude toward his job has duties enough without doing inspection work. Furthermore, the average workman mostly considers an inspection with strict rules for rejections as something working against him. So a foreman who inspects and rejects the parts done in his own department may have to suffer by the fact that his men object, and will distrust him while he is trying to attain the object of dealing with his workers as their leader, and of being the connecting link between them and the management.

—H. W. TH. PORSIEL.

Keeping Track of Improvements

IN OUR plant we have a method of keeping track of improvements originating in the shop, which has been found to work well in practice over a number of years. The medium is a works improvements committee that meets once a month. The suggested improvement is written and often accompanied by a sketch, and handed to the shop representative, who submits it to the monthly meeting of the committee. After discussion, it is passed on to the management for consideration. Here it is placed on the workmen's improvements list, and however trivial, it is not permitted to be removed until finally disposed of.

Every month an "arrears list" is made out to ensure that every suggestion is being considered or reviewed. Urgent suggestions may be handed in to the secretary and receive attention at once. The method of award is based on the value of the idea. Further, an amount equal to 50 per cent of the award is paid in addition into a benevolent fund, which is managed by the committee, and used for charitable purposes.

During the past few years, more than 600 ideas have been dealt with, and a sum of over $1,350 paid out in awards. This has been done in a works of moderate size.

—J. W. PEPPERDINE, *Secretary, England.*

THE · NEXT · TOPIC

"They Set Their Own Rates"

ADVANCE QUESTIONS

Under what conditions is it wise to let men set their own piece rates?

What is likely to be the result of such a policy?

Saving the Job of the Careless Workman

THE easiest way to have ended the case in question would have been to fire Miller. It must be borne in mind, however, that the easiest way is not usually the best.

I have in mind an experience with a toolmaker that was quite similar to Miller's case. He was a good man whose work had shown one careless mistake after another, so that it was obvious that it could not continue. To fire him would have been easy and final. However, I had an idea as to the cause. I found out from his companions that his trouble was financial difficulty and a sickly wife. These two things worried him at the shop and reflected in his work. A little encouraging talk had the desired effect, and improved his work. If a good man has a streak of carelessness, it justifies at least an investigation of the cause before the last resort of firing.

—WALTER W. YEAGER.

FIRING a man is an example in more ways than one. It is an example of failure on the part of the executive to get results from the most wonderful machine of all, a human being. For many it is undoubtedly an easier way, much easier than trying to understand a man, his troubles and his possibilities. These things require thought, sympathy, imagination and courage, whereas

firing a man is an easy way out. It evades the duty of education, direction, understanding and leadership. Williams and Al were justified in trying to save Miller's job. They were justified by results, and by their faith in their own ability to get them.—JOHN J. WOFFINGTON.

Side-tracking an Old Customer

AL WAS right in sticking up for Brown's work, as an old customer should not be sidetracked for a new customer if a delivery date promise has been made to him. The shop that sidetracked old customers continually in the past did not get away with as much as they thought they did, and they are the ones that have to spend large amounts in getting and trying to keep new customers.

Give the new customer a fair delivery promise, and if necessary to keep the promise, work overtime and get the job out. In this way we learn a lot about what we can do on the new work and at the same time we keep up our service to the old customer. Getting customers is not half as hard as keeping them.

—ARTHUR HALLIWELL.

THE idea of side-tracking an old customer to give service to a new one is not the solution of the "rush" question, as it is decidedly unfair both to the old and to the new customer. A firm wishing to build up confidence among its customers that will last through the years, and establish them as a permanent concern, must necessarily fill orders on time, regardless of added expense to itself. —O. W. COOPER.

THERE is just one thing to do if overtime is to be avoided, and the new customer is to be pleased by quick delivery. Put it right up to Mr. Brown, and ask him what he would do in a case like that. Tell him that you value his good will too much to follow the practice of letting the old friend wait, but that you would appreciate it if he would see his way clear to give you an extension of time.

If approached in the proper spirit, and Brown can possibly do it he will not only extend his delivery date, but he will appreciate your frankness, and think more of you for approaching him with a personal problem of this kind. —J. C. P. BODE.

Calling Down the Old Man's Relatives

AL WAS right in defending the watchman, for the latter was performing the duty for which he was hired. If the workmen know that rules apply to everyone, then they will obey them willingly. As for Williams, if he is a real superintendent, he will not fire the watchman, but will make it a point to let him know that his attention to duty is appreciated. —ARTHUR R. MYERS.

NO favors should be granted to anyone just because he happens to be related to someone higher up in the organization. If the foreman is not sincere in enforcing the rules without fear or favor, he will soon lose the respect and co-operation of his men. To give the relatives of the boss special privileges would very plainly say he was trying to curry favor at the front, and would spoil the morale of the shop.

Many a boss has gotten a good "kick" out of the fact that a relative, who was placed in the shop through pressure brought to bear in the family, has to "toe the mark," and is not permitted to break the rules and get away with it, just because of relationship. —A. TOMLINSON.

Insurance and Savings in the Shop

THE workman who lives from hand to mouth is not only doing himself and family an injustice, but invariably his workmates also bear a part of it. Surely, the inevitable subscription lists would be more rare if thrift clubs were more general in shops. After all, a feeling of security during times of illness is much better than the feeling of dependence on charity.

As for the firm butting in on such affairs, the pity is that most firms do not butt in enough. The mere fact of the firm taking an active interest in the personal welfare of the workman is sufficient encouragement for the men to become attached to the firm, and cases of resentment on the part of the workman would be practically nil. —WILLIAM H. COOPER, *England*.

Making Time Studies

THE purpose of time study is not only to set a rate, but also to cut out waste, standardize conditions, and improve methods. If the management is willing to come out in the open, it invites the same attitude on the part of the men.

However, there is no way to avoid the fact that the individual benefits more if he holds back to a certain extent while a job is being timed, and as a result gets a lower standard than he would have otherwise. He goes home with more money in his pocket at the end of the week than he would have had if he had worked at his normal pace while being timed. That is a problem for which I have not found an entirely satisfactory solution as yet. The observer can talk to the operator to get his confidence, have another operator do the job, or have the foreman do it in front of the operator. Secret time studies do not solve the problem, and are likely to cause dissension in the shop. —J. E. BLACK.

SECRET time studies are never justified. Most of the shopmen are honest, and resent anything that they believe is done sneakingly. So when they find out that secret time studies are being taken, they will take advantage of every opportunity to put over on the time-study man anything they can. Secret time studies breed discontent and disruption in any organization, because they are unfair, and everyone hates a sneak in industry, the same as anywhere else. If the time study is not taken at the machine or bench, the foreman has no chance of convincing the man that the performance called for is possible. The foreman, therefore, losses interest, and becomes a hater of the system, and the system without the support of the foreman will fail. —A. HALLIWELL.

IDEAS · FROM · PRACTICAL · MEN

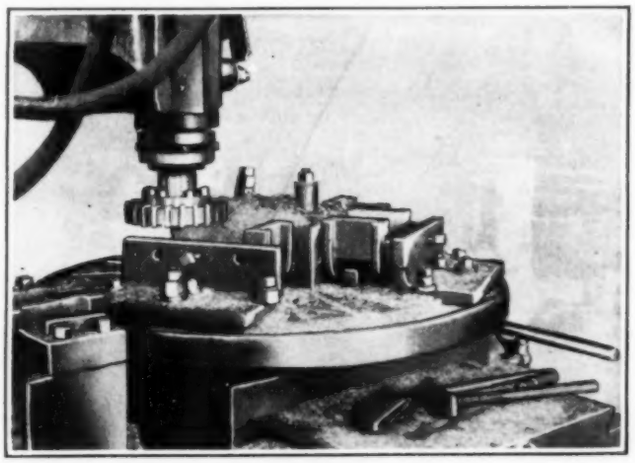
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Continuous Milling Rod-End Brasses

By Milton Wright

An improvised fixture used in the Billerica shops of the Boston & Maine Railroad to hold rod-end brasses for machining is here shown. A square block secured to the table of a Newton vertical milling machine, coincident to its center of rotation, provides four vertical faces against which the brasses are held. Pressure to hold the brasses in place against the action of the milling cutter is applied by setscrews threaded into angle plates bolted to the table opposite to each face of the central block.

The table rotates continuously, the operator having ample time to take out each brass as it is machined and



Continuous milling fixture for rod-end brasses

set another casting in place while each station is passing through the idle portion of its path.

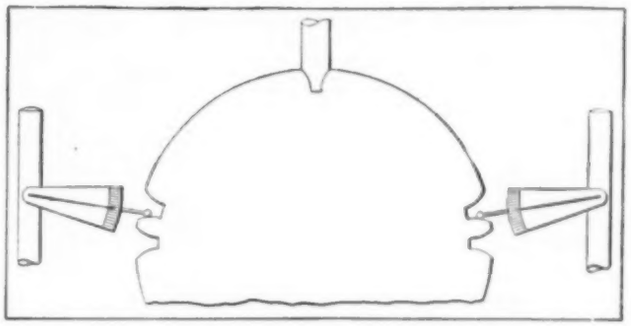
The same fixture is employed to machine the bosses square with the bore on each side of the brass.

Centering the Gear Cutter Accurately

By H. J. Gustav Kopsch

We had to cut some gears for an accurate experimental machine and, having no gear cutter, were obliged to do the work in a universal milling machine. Naturally, we used the best milling machine in the shop and took the precautions to see that there was no backlash in the dividing head, that all bearings were properly adjusted, and that the centers were of equal height and in alignment.

In setting the cutter over the center line, we used the method given on page 150 in Brown & Sharpe's *Practical Treatise on Milling Machines*, but the gear teeth showed an off-center error of several thousandths. Then



Centering the cutter by indicating trial teeth

the "big boss" showed us how to center the cutter accurately. His method was to set the cutter as nearly central as possible and to cut a few teeth. Then to rotate the gear blank 180 deg. and cut a few more teeth. Next to rotate the gear blank 90 deg. and check the highest points on the flanks of opposite teeth by an indicator. One-half of the difference between the height of opposite teeth will be the distance necessary to move the table to bring the cenetr of the gear blank under the center of the cutter. The illustration shows the procedure.

Of course, it is advisable to check by trial once more after adjusting the table. In cutting the trial teeth it is well not to cut to the full depth, so that the final cut will take out enough to eliminate the errors made before the table was adjusted and thus save the trial gear. The method outlined is accurate within 0.001 or 0.002 in. and is absolutely positive. It can be used, of course, only for gears having an even number of teeth.

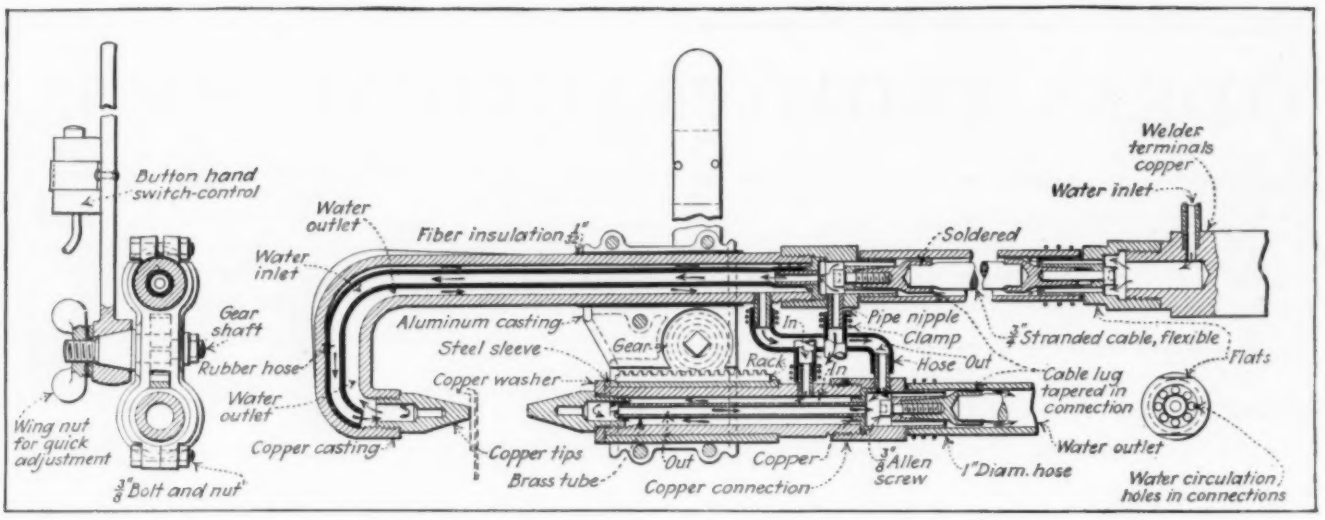
A Portable Spot Welder

By Daniel D. Eyster

Sometimes it is difficult to take work to a machine or to swing it into position to operate on it. Then it is necessary to take the machine in a simplified form to the work.

The illustration shows a portable spot welder to be taken to the job. In this case it is a production job, spot-welding $\frac{1}{8}$- to $\frac{1}{32}$-in. metals, and the portable welder as shown is highly successful. It is easy to operate, positive in action, always cold, and can be operated at any angle.

The goose neck and ram are copper castings with $\frac{3}{4}$-in. cored holes. The aluminum bracket that is clamped to the goose neck, is protected with fiber insulation at the point of contact. The bracket is bored for a slip fit with the rack sleeve and also provides a bearing for the gear shaft. The handle, which is approximately 12 in. long, is fastened to the gear shaft by a taper fit and is clamped in a convenient operating position by the large thumb-



A portable spot welder

screw. With a gear 1½ in. in diameter, a pressure of approximately 350 lb. is provided at the welding points.

As will be noticed, water for cooling enters the machine terminal and circulates through the large rubber hose which entirely surrounds the stranded cable. This construction makes possible the use of a much lighter cable than would otherwise be required. The cable lugs are soldered to the cable and fitted to the connections through a slight taper, drawn into place by a capscrew. This construction provides a means of replacing the hose or assembling the parts without trouble. It also provides a positive circulation of water past the neck and up to the point. By cross connecting the water chambers there is a positive cold-water flow to both points.

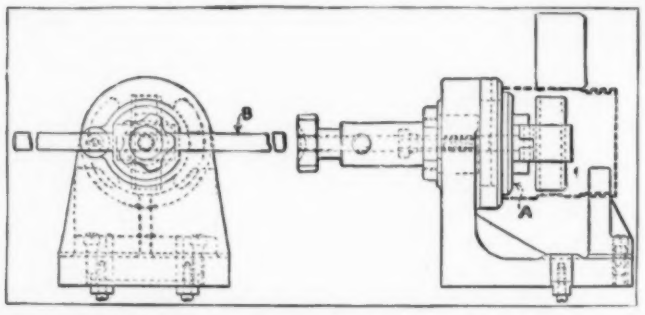
The entire outfit is connected to a standard spot-welding transformer-unit, and the hand button-switch on the lever is used to control the apparatus. Before this welder was put in operation, the job could not be produced except by acetylene welding, which was costly, and involved considerable finishing work later.

Fixture for Milling Relief on Pistons

By Edward T. Heard

A simple fixture for milling the relief on the sides of automobile pistons is shown in the illustration. The piston fits over the locating plug *A* and is held thereon by means of a draw-in rod attached to a pin through the piston-pin holes. The piston is indicated by heavy dotted lines.

An index pin entering one of the elongated, circular slots, to be seen in the elevation at the left, limits the amount of rotation of the piston under the cutter. When the relief has been milled on one side of the piston, the index pin is withdrawn and the locating plug is rotated until the index pin can be entered in the opposite slot. This movement brings the other side of the piston under the cutter and the milling is proceeded with as before. The lever *B* is used to rotate the piston, both for indexing and during the milling operation.



Index fixture for milling relief on pistons

A Universal Outboard Support

By Ellsworth Sheldon

A table to support an overhanging weight, used in connection with a slotting machine when that machine is engaged in shaping the frames of locomotives, heavy connecting rods, and similar parts, is shown here.

The table itself is shown in Fig. 1, while to the right in the same illustration and on a level with the upper

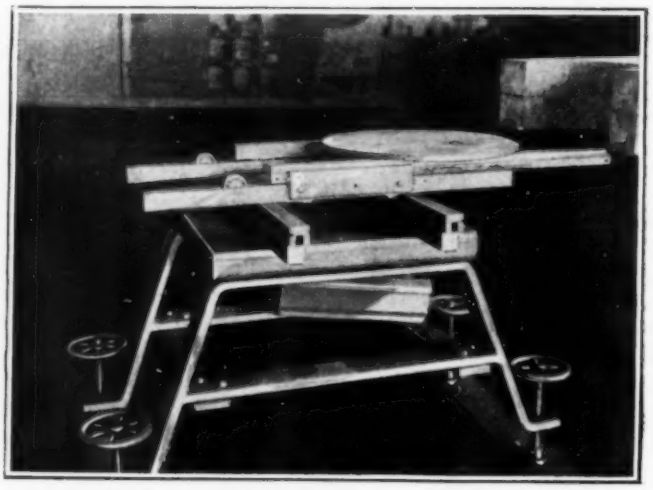


Fig. 1—A ball-bearing universal support

surface of the circular plate may be seen the ends of a pair of frame sections that are clamped to the table of an adjacent slotting machine. As here shown the frames are practically in balance on the slotter and need no extra support, but when the work has been moved along as in Fig. 2 in order to allow the tool to reach another part, the support is brought automatically into service.

As may be seen in Fig. 1, each leg of the device is pro-

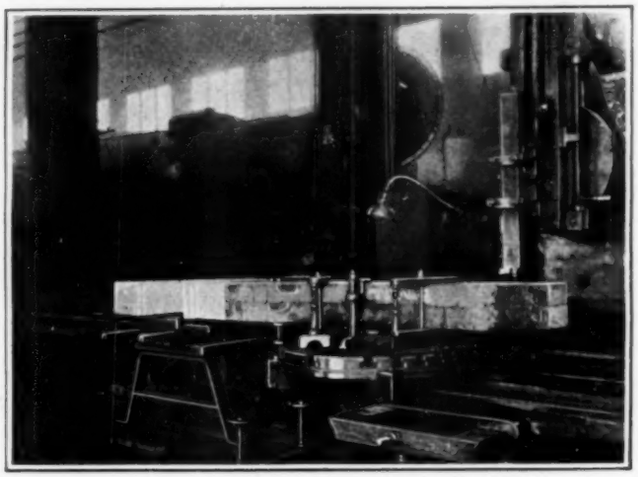


Fig. 2—Locomotive frame sections upon a slotter with overhanging weight supported on universal table

vided with an elevating and leveling screw by means of which the surface of the circular plate is adjusted to the plane of the slotting machine table. The plate revolves upon a ball bearing, and is in turn supported by a ball bearing carriage having horizontal movement in two directions at right angles.

The bearings are standard ball bearings, carried on studs that are cut away for half their diameter where they are set into the rails. A mortise in the rail provides clearance for each of the bearings to revolve. Because the mortises are cut clear through the rails, there are no pockets in which chips and dirt might accumulate to interfere with the free action of the bearings. The mating rails in each case are merely square bars of steel with a groove of square section running the whole length of each.

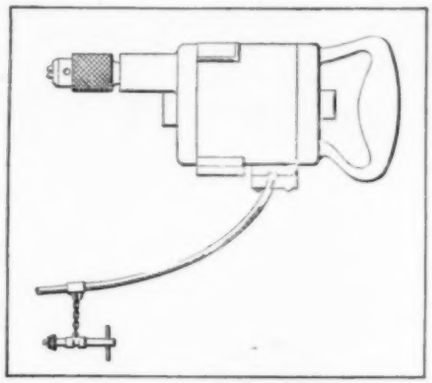
Because of its freedom of movement in any direction upon bearings that are practically frictionless, the support imposes no restraint upon the work resting on it, which may thus be guided by the movements of the slotting machine table as freely as if it were balanced upon it.

This device was built and is in service in the Billerica shops of the Boston & Maine Railroad.

A Place for Chuck Wrench

By R. L. Austin

The use of the electric drill, usually has one annoying feature—the chuck wrench. If it is unattached, it is soon lost. If it is attached in the usual manner with several inches of chain, it dangles in the operator's way. The illustration shows how I remedied the matter. The chuck wrench is attached to the cable by means of two clips and a short piece of chain. The clips were made of sheet metal. The wrench has a groove turned in the shank to accommodate the wire that is furnished for attaching it. I removed the wire and put the sheet-metal clip in place. I then peened a groove in the clip exactly over the groove in the wrench shank, taking care not to get it too tight. The wrench turned freely in the clip but was held in place laterally by the groove.



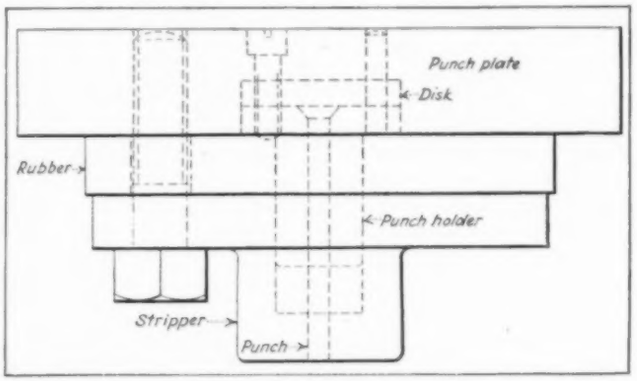
A convenient holder for the chuck wrench

By this method the wrench is always there when needed and is never in the operator's way.

Press Tools That Violate an Old Rule
Discussion

By Samuel Kauffman

The design of a punch shown in an article by Roy E. Peterson, under the title given above, and published on page 593, Vol. 67, of the *American Machinist*, can be much improved in the way of saving steel. The punch shown by Mr. Peterson is a glaring waste of tool steel, because the shank is very much smaller than the base. This waste will be increased after grinding the business



The author's design of the punch

end of the punch a few times, because the whole piece will then have to be discarded as a cutting tool. The use of rubber as a compressive member also meets with disapproval, it is not being used in die design.

Considerable saving in tool steel would be effected if the punch were made as here shown. The punch plate, made of machine steel or cast iron, has a recess bored in the center to take a hardened and ground tool-steel disk. The punch holder, of machine steel, has a flange which also fits into the recess, being held by screws and a dowel pin. The punch holder has a centrally drilled and reamed hole, countersunk at the top for the punch. The punch, a piece of drill rod, is upset at one end and is pressed into the punch holder. The punch is hardened and ground, and the holder is left soft.

Welded Steel vs. Cast-Iron Jigs
Discussion

By John Woffington

Referring to the article by Jim Henderson, under the title given above, and published on page 703, Vol. 67, of the *American Machinist*, I think a casting could have been better proportioned for strength and lightness than the jig illustrated by Mr. Henderson.

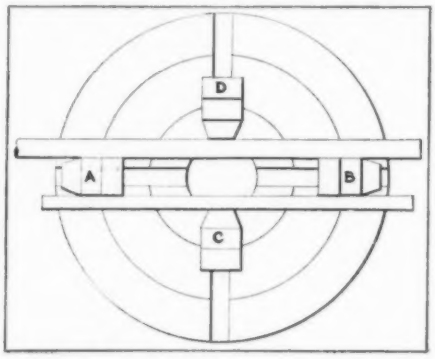
Where accurate work is required, the rigidity of jigs and fixtures is one of the essentials. That property is

best supplied by cast-iron jigs and fixtures having as few joints as possible. If they can be cast in one piece, so much the better. Cast iron is more rigid than steel. A steel jig put under a heavy strain or subjected to a blow, may bend and much production be spoiled before the damage is discovered. On the other hand, under the same circumstances, a cast-iron jig will either be broken or receive no material injury. A broken jig has the advantage over a bent jig because the damage is at once apparent.

A Lathe Chuck as a Straightening Press

By Harry Moore

Having to straighten out some short bends on a batch of rods and finding no straightening press available in the shop, I used a lathe chuck in the following way. Procuring a flat piece of stock I placed it beneath the jaws *A* and *B* as shown in the sketch and brought up jaw *C* to support it. Then I laid the rod to be straightened on the opposite sides of jaws *A* and *B* and brought pressure to bear on it with the jaw *D*.



How the lathe chuck was arranged for straightening rods

The centers of the same lathe were used to twirl the rods to determine the high spot. Having found this I marked it and also the extreme ends of the bend. Then I adjusted jaws *A* and *B* out or in to suit these marks.

By arranging the flat piece and jaw *C* beneath the others to support them there is no danger of undue strain.

Dimensioning Drawings—*Discussion*

By C. G. Williams

It would seem as if no one writing on the above subject wishes to make any statement as to superiority of any of the various methods in use. Everyone seems to want to sit on the fence and offer various reasons for the use of them all.

I believe that the proper way to write the dimensions given by Frank C. Hudson on page 442, Vol. 67 of the *American Machinist* is to reverse them, as $\frac{3.002}{3.000}$, writing the larger size above and the smaller size below.

In talking with toolmakers (my original trade) on this subject I find their preference to be in line with mine; that this type of dimensioning is best because it most clearly states what the designer wants.

The top limit gives the figures to consider as the main dimension. As one old toolmaker said, "Hold to the top figure. If you get the work larger you can still take some off, but if you get it smaller there is no putting on tool handy." Another one states, "For fits, work to the top dimension for the male member and the bottom dimension for the female member."

Perhaps a better way would be to think of these dimensions as the lower for internal work and the upper for external work. Then the workman has no need to make mental additions or subtractions, with the possibility of mistakes occurring through watching a machine while he is setting the mikes.

Using the Shaper as a Marking Machine

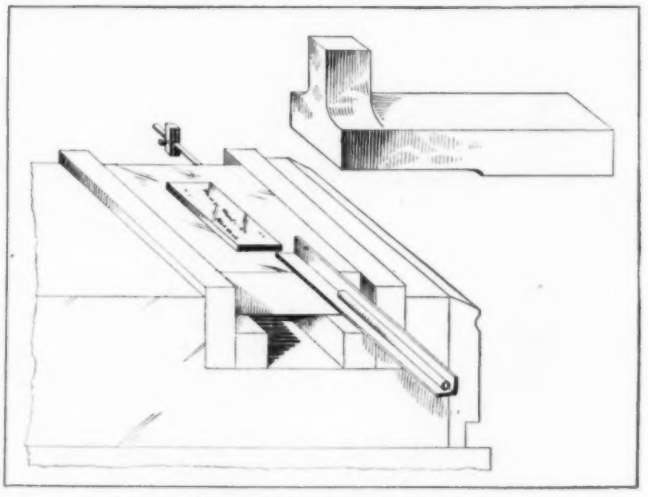
By D. A. Rogers

Instructor of Machine Shop Practice, University of Minnesota

The problem of how to mark the maker's name on various sizes of copper tubes used in welding apparatus, was solved by making the very simple device shown in the illustration, and used on a 16-in. shaper.

The marking die was mounted on a cold-rolled steel block held in the machine vise, and a piece of angle iron served as a guide in feeding the tubes. An adjustable stop at the left located the tubes so that the marking would be in the proper place, lengthwise.

The block to be seen in the upper part of the illustration was held in the toolpost and extended rearward, the bottom face being slightly relieved from the front to a point about ½ in. to the rear of the clapper-box pin. In operation, a tube is placed in the trough of the angle iron while the shaper ram is in the rear position. When the ram moves forward, the tube is rolled over the marking die by the rear part of the block in the toolpost, and drops off at the front.



Device for marking work in the shaper

The reason for the clearance in the front part of the block in the toolpost, is to bring the marking pressure at a point to the rear of the clapper-box pin, otherwise the clapper box would lift and no pressure would be exerted. With this device, a skillful operator soon learns to feed the tubes while the shaper is running at a fairly fast speed.

Televox is the name given a device that, used in connection with a telephone, gives remote control over various types of apparatus such as circuit breakers in substations, and can perform other operations in different lines of work. It is a new device, necessarily crude as yet, but apparently having possibilities in the way of saving much human energy. It is credited to R. J. Wensley, switchboard engineer of the Westinghouse Electric & Manufacturing Company.

Characteristics of Molding Compounds

Casein Plastics

The casein plastics form a group of materials now being marketed in the form of rods, tubes, sheets, and molding powders, and used for the manufacture of a wide variety of parts formerly made of metal. They are marketed under various trade names, such as Karolith, Aladdinite, Erinoid, Inda, and Galoith.

Casein plastics are made from casein which is precipitated or "curdled" from skim-milk by the action of rennet. The process of making the plastics in general consists in plasticizing, and then hardening with a solution of formaldehyde. There are various patented processes for manufacture which differ considerably from each other. Casein plastics are odorless, noninflammable, and are excellent electric insulators. They are colorless, or can be blended with pigments and made to any color, or mottled, and they take a high polish. While they are not as readily molded as phenol resins and are not as hard, they have the advantage that they can be machined easily. The largest use for the casein plastics has been in the fields of jewelry, novelties, counters, chessmen, toilet articles, and fancy handles, but they have been coming into more general use for many kinds of electrical and mechanical parts, and for such things as tool handles, cover plates, and knobs. They are also used as substitutes for hard rubber.

The specific gravity of the casein plastics is about 1.35, or approximately the same weight as celluloid. They are, however, considerably harder than celluloid. They are resistant to oil, alcohol, benzene, or dilute acids, but are attacked by alkalis. They absorb water if immersed or are exposed to a moist atmosphere. The casein plastics are nearly synthetic horn, but some of the commercial plastics may be obtained with fibrous or other filling materials, or with various salts to make them waterproof.

The casein plastics for mechanical applications are obtained in powdered, or tablet, form for molding, or in sheets, rods, and tubes ready for machining. The molding is done in dies by the application of heat and a pressure of about 2,000 lb. per sq.in. The sheets can be shaped or formed in dies by first softening in a hot water and glycerine bath. For punching or blanking the material should also be softened. Carbon-steel tools can be used for all machining operations, and are worked at high cutting speeds. The cutting speeds in sawing are the same as employed for hardwood. Sawing and machining of the material is done dry. Standard twist drills, taps, and dies are used, but must be kept sharp. High-speed steel tools are recommended for turning and milling operations, and large clearance and rake are used in order to give a shaving cut. Grinding may be done with ordinary abrasive wheels.

The finishing of articles made of casein plastics is done by tumbling with ground pumice and sawdust, or by polishing on a rag buff, using standard polishing compounds. The desired colors are usually incorporated in the material during its original manufacture, but dyeing of the casein plastics can also be done in an acid-aniline bath heated to 180-200 deg. F. The dyeing is done after the final polishing, and no buffing is required after removing from the bath unless two-tone effects are desired. These are obtained by polishing the high spots before the dye is thoroughly dried.

Pyroxylin Plastics

The pyroxylin plastics, including materials marketed under the names of Celluloid, Xylonite, Celanese, Fiberloid, Pyralin, and Viscoloid, have had a wide variety of uses for novelties, toilet articles, photographic films, toys, buttons, fasteners, and knife handles, but are also used for making many mechanical and electrical parts where inflammability and comparative softness are not objectionable. Pyroxylin is composed of a solution of nitro-cellulose. For making the molding compounds it is mixed with camphor, and sometimes other materials. The characteristics of the product vary widely according to the material used. The nitro-cellulose employed is made by nitrating cotton or other vegetable fibers with nitric acid. Alcohol or fusel oil are usually used as the solvents. Pyroxylin plastics are naturally colorless or amber colored, but pigments or dyes are incorporated during the manufacture, and any color is obtainable. The material is made in solid cakes from which sheets, rods, and tubes are cut.

Pyroxylin plastics can be machined readily, but since most of this material is highly inflammable, the chips must be carefully guarded from fire. They can also be molded in dies at fairly low temperatures. By softening the sheets in solvents they can be drawn or shaped in dies, or can be forced to any desired shape in blowing dies. The plastics are tough and flexible, but are not hard like the phenol resins. The tools and methods used for machining pyroxylin plastics are in general similar to those required for the casein plastics. The facility with which both classes of these plastics can be machined is giving them an increasing field of mechanical usefulness.

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· TECHNICAL · ABSTRACTS ·

Application of Roller Bearings to Railway Cars

Many attempts have been made in recent years to apply anti-friction bearings to railway cars. The present article discusses the design and application of the tapered roller bearings. The principal object of the tapered construction is to provide capacity in the bearings for thrust loads without sacrificing vertical load carrying capacity. The rolling resistance is about one-tenth of 1 per cent.

The bearings have two sets of rollers with a double-grooved inner race, or cone, and two separate outer cups. The cone is mounted on the axle under a heavy press fit to prevent wear on the axle by creeping. The cups are also given a press fit in the housing to a lesser degree. The journal box proper consists of two housings, an outside one and an inside one, and the cover. The inside housing is crowned at the top and bottom to make the unit self-aligning. The inclosure is an integral part of the inside housing and consists of a series of angular grooves. The same part also acts as a puller when it is necessary to remove the sleeve from the axle.

One of the important features of the design is the degree of flexibility possible in the application. There is a space on both ends of the inside housing between it and the outside housing. The wheels, axles and bearings may, therefore, move this lateral distance relative to the car body.

Grease of about the consistency of vaseline is being used as a lubricant. It is more easily retained in the bearing housing than oil and produces lower bearing temperatures. Grease also has the beneficial effect of gumming up of the outside of the inclosure, thereby materially assisting in keeping out dirt and water and retaining the remainder of the grease. Because of the inclosure there is much less wastage of grease and refilling is necessary only at infrequent intervals.

Tests have indicated that it takes about nine times as much force to start a plain bearing car as it does one equipped with these roller bearings. Under normal running conditions, the power saving is about 17 per cent. In one test the roller bearing car coasted a distance of 7,200 ft. against 1,300 ft. for a car equipped with plain bearings.

Besides decrease in friction several other advantages are claimed for the tapered roller bearing: Elimination of hot boxes; economy in inspection and maintenance; economy in lubrication; faster acceleration and easier riding qualities for the passengers. The train can be stopped and started without the usual jerks.

The estimated life of the roller bearings under normal operating conditions is one million car miles. It is estimated that a plain brass bearing would have to be changed about 30 times during this period.

Where the grades are moderate, the same locomotive can haul a larger number of cars. It is not necessary to cut down train loads during winter months when considering freight car practice. Most of the applications thus far have been applied to passenger trains on the Chicago, Milwaukee & St. Paul Railway.—Walter C. Sanders, *Mechanical Engineering*, December.

Grinding Wheels Replace Sandstones

The serious effects of dust inhalation in the various British industries where the grinding of metal plays a large part are constantly engaging the attention of the British government's chief inspector of factories and workshops. In the Sheffield district, mainly concerned in the production of cutlery, progress is not as satisfactory as it should be, owing to the marked antagonism of craftsmen and employers to any alteration of the craft methods that have been handed down from father to son for generations. In Birmingham, however, considerable progress is being made in the adoption of more up-to-date methods.

In miscellaneous grinding industries much has been done to bring the factories into line with modern conditions. Sandstones are being replaced by abrasive wheels whenever the former are worn down, and it is expected that soon all grindstones will have disappeared. Much work has been done in pulling down old grinding mills and dressing shops, and completing and equipping new shops with efficient exhaust ventilation.—W. Hamilton Gordon, *Abrasive Industry*, December, 1927.

The Next Revolution in Industry

The industrial revolution began with Watt's steam engine and its battles were fought and won by the engineer. The next revolution has begun in the test-tube and will be carried on by the chemist. Its origin may be traced to the world war when scarcities of vital necessities forced the chemists to discover substitutes. Tremendous demands for acetone led to the development of a new fermentation process for its manufacture. Butanol was a byproduct and was useless until it was discovered that the base for the modern automobile and furniture finishes could be made from smokeless powder. Butanol and butyle acetate are solvents of this base. Other by-products were considerable amounts of hydrogen and carbon dioxide. Hydrogen is combined with nitrogen from the air to form ammonia which, when converted to nitric acid, has many industrial uses. Eventually a way was found to make methanol out of the hydrogen and carbon dioxide gases.

Exhaustion of natural resources is not so serious if substitutes are at hand. When petroleum is used up we have methods of making gasoline and oils from coal to meet our needs. Unless new sources of lead, tin and nickel are discovered our supplies will be gone in less than 20 years. Plans must be made to provide substitutes.

No industry is safe from the chemical revolution. Chilean nitrates are being supplanted by synthetic ones, sausage cases are being made synthetically, rayon manufacture has increased 90-fold in 15 years, artificial wool is being made, "dry ice," or solid carbon dioxide, exerts the cooling effect of 15 times its weight of water ice and without the wetness and muss. Cotton linters are used in the paper industry and in the manufacture of rayon, celluloid, and smokeless powder. Ethyl gasoline is changing the design of automobile engines. Beryllium will probably be available shortly in commercial quantities that can be alloyed with aluminum to produce an alloy one-fifth lighter than aluminum and stronger than duralumin.

It is predicted that ultimately all manufacturing will be chemical except cutting, fitting, weaving and molding.—Gustavus J. Esselen, Jr., in *The Magazine of Business*, December.

Manufacture of Cannon at Watervliet

The manufacture of 14-in., 50-caliber breech-loading guns of the built-up type is considered representative of general practice. The first operation on all major forgings is the telltaling, the purpose of which is to determine that there is sufficient metal properly distributed to allow for machining to prescribed dimensions. The procedure is to place the forging in a lathe, one end held in the lathe chuck and the other end held in a revolving rest, then by adjustment of the chuck and the rest cause the exterior of the forging to run true. When readings have been taken throughout the bore, and the results indicate sufficient metal to cover any eccentricity, spots of a prescribed width and diameter are turned on the exterior. These spots then become the basis of alignment for the subsequent boring.

The reamer or boring tool used to produce cylindrical bores has a flat cast-iron or cast-steel head, at the forward end of which are two recesses in which the cutters are mounted. The cutters on the roughing reamer have the cutting edge on the extreme forward end of the cutter, and at right angles to the axis of the bore. The cutters on the finishing reamer have their cutting edge on the side, with a slight taper on the forward

end for a gradual entry of the cut. Both types of reamers are lined with well-seasoned, oil-impregnated hard maple blocks. These blocks are bolted to the flats of the reamer, and then turned to a diameter slightly larger than that of the cutters. A good, firm fit of the wood blocks in the bore is absolutely essential, since this is all that controls the direction of the reamer.

Oil is fed in large quantities to the reamer cutters at about 20 lb. pressure. Mineral-lard oil is generally used on all boring operations. A cutting speed of about 16 to 18 ft. per min. is used on the roughing reamer, with a feed of 0.03 in. per revolution. The finishing reamer is run at a cutting speed of 10 to 12 ft. per min., with a feed of 0.08 to 0.10 in. per revolution. The stock removed by the roughing reamer is irregular to such an extent that the width of the cut on one side in the bore may be $\frac{1}{8}$ in., and on the other side barely enough to true off. The finishing reamer is always removing a definite amount of stock.

The inner tube or liner in a 14-in. gun is preliminary bored to 13.7 in., using two reamers as described, before being turned for assembling in the gun. The finish of this bore must be such as to permit star-gage readings to within 0.0005 in. The boring of the main tube forging is composed of four cylindrical zones of diminishing diameters toward the nozzle end. When finally prepared for assembly of the liner, this bore has been converted to four tapered zones. After each roughing reamer, the bore is telltaled to insure that no run-out exists. Should the bore be found not true, another roughing reamer has to be prepared of a size that will straighten out that zone with the smallest possible amount of enlargement.

After the assembly of the liner, the gun is finished bored, and must be within 0.001 in. of prescribed size in addition to being smooth, straight, round and true with the axis of the gun. One roughing and one finishing reamer are used for this operation. Cutting the rifling grooves is one of the most accurate and delicate operations, and the most expensive per pound of metal removed. No real roughing cuts can be taken in this operation, and as the depth of the groove in a 14-in. gun is 0.12 in., it requires a great number of passes to complete the operation. A special machine is used for this purpose. During all manufacturing operations, each piece of work must pass through the inspection department.—Hugh Smith, *Army Ordnance,* Nov.-Dec., 1927.

The Milwaukee Apprenticeship Plan

The program of apprenticeship carried on by the Milwaukee branch of the National Metal Trades Association is expected, before many years have passed, to supply all the skilled men required by the metal trades in that district. The program is based upon the fundamental principle that all the companies in a given district are jointly responsible for the development of skilled men, and that each plant in the district must share this responsibility approximately in proportion to the number of skilled men employed by it.

At the present time apprenticeships have been established for blacksmiths, boilermakers, coremakers, draftsmen, electricians, machinists, molders (both steel and gray iron), patternmakers, stationary engineers, toolmakers and diemakers. Twenty-eight plants are actually engaged in training apprentices. The products range from the largest hydro-electric machinery to the smallest hand tools.

The plan involves transferring apprentices whenever necessary from one shop to another, so that although some of the plants may not be equipped to give the boy a thorough all-round training he can learn the work in each shop and thus at the end of his apprenticeship course he will have acquired a sufficient variety of experience fully to qualify him as a capable workman at his chosen trade.—C. J. Freund in *Machinery,* December.

Efficient Production

Most factories are comparatively inefficient, as can be shown by a simple formula to obtain comparative results. Percentage efficiency in an automobile machine shop, for instance, may be represented as $\frac{H \times C \times 100}{M \times A}$ where H is the actual number of machine hours taken to produce a set of machined parts for a car, C the number of sets of machined parts per week, M the number of machine operators employed, and A the number of hours in a working week. This method of comparison can be applied to a whole works, and, although it is a check on planning and organizing efficiency only, it is useful in indicating wastage.

What the production engineer requires is the overall efficiency, including incidental labor, whether times allowed or taken are reasonable, and whether administration in relation to output is excessive or not. This is the relation of the full amount of work put in to the work gotten out. The work put in includes buildings, plant, equipment, the whole of the labor, whether productive, non-productive or administrative, and any charges directly attributable to production, but not sales or any stage beyond completion of the finished article.

The term "work" is used in the same sense as in mechanics, i.e., foot-pounds; from the production point of view, capital must be divided into applied capital and working capital. Applied capital is the part that directly influences production costs, and is represented by buildings, plant and equipment. This is the concern of the production engineer, the working capital being the concern of the control and the directorate. There is a connection between the two, for, with applied capital and productive science efficiently combined, the working capital can be considerably reduced. It may be somewhat difficult to visualize applied capital as accumulated work with the capacity of converting ft.-lb. of work, but due consideration will show it to be correct. Also the applied capital of an automobile factory, which is work put in, represents work gotten out by the factories producing the machine tools, plant, etc. To facilitate calculation it is easier to figure in currency than in ft.-lb., but the connection should always be borne in mind.

The overall efficiency of the factory is, therefore, represented by the ratio between the output and the applied capital, together with all work put in. Reasoning on these lines it should be clear that, given certain capital to produce a given article, the applied capital should be applied so as to utilize efficiently a maximum amount of motive power and transform the ft.-lb. of work developed by means of efficient machinery requiring the minimum amount of ft.-lb. of human labor, but the maximum of human controlling power, to produce the largest number of articles in the least possible time. In other words, put in as many ft.-lb. of the work as the limitation of applied capital will permit, and transform this by means of efficient machinery into finished articles with the minimum amount of human effort.

Balance in the application of the capital must, of course, be observed. It should be possible to make calculations and arrive at the overall efficiency, for the power required to remove metal is known. From motion study the human effort can be calculated, and all other factors are obtainable. Motion study is, of course, a subdivision of production science, since it aims at reducing the ft.-lb. of work put in by a man when working. Actual results would be interesting, for the author's investigations lead him to believe that human efforts up to the present are extremely wasteful, and a large amount of work is put in to obtain comparatively small results.—Herbert E. Taylor, *The Automobile Engineer,* December.

Magnesium Alloys

Magnesium is rapidly winning recognition as a useful engineering material, although before the war it was practically unknown except in the laboratory. It is the lightest known metal possessing permanence and stability. In 1921 the production of magnesium was only 48,000 lb., but this was increased in 1926 to 322,650 lb. It is being used in alloys in the automobile and aircraft industries, and eventually will find extended applications in other industries.

The greatest development in the uses of magnesium will be in ultra-light alloys for engineering and structural use, as the alloys are one-third lighter than aluminum alloys, and the strength is superior on a weight basis. An interesting use is for press-forged resonator disks for automobile horns. No other metal produces such clear, resonant tones as the magnesium alloys. There are possibilities of using this material in other sound-producing instruments.—John A. Gaun and Arthur W. Winston, *Engineering and Mining Journal,* Dec. 24.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

What's Ahead?

OPTIMISM is so universally the keynote sounded by forecasters of 1928 business conditions that one cannot help but be caught up in the general enthusiasm. Business forecasting is far more dependable now than it was even a few years back, for the reason that those engaged in it are much better equipped with facts and fundamental principles than they ever were before. There is also this to be said, that the economist is naturally unenthusiastic and more apt to be pessimistic than the contrary. When he manifests optimism, therefore, his attitude may well be hailed as good news.

A year ago most of us rather expected that 1927 would not be as big a business year as 1926. In the transportation and metal working industries, among others, that expectation was realized, but several other industries, notably textiles, lumber and leather, suddenly revived and did so much better that they offset the losses in other lines and put the total business of the year practically on a par with that of the previous one.

It must be remarked, however, that profit margins shrank in every branch of industry. Some over capacity and a great deal of intensely keen competition conspired to this end.

A year ago it was suggested in these columns that business had arrived on top of a broad plateau and that it would remain on that relatively high level with only insignificant ups and downs. Experience seems to be bearing out this conception. Now we can carry this figure of speech a little farther. The high plateau of business is relatively limited in horizontal area. In other words, there is room there for the well-managed, adequately-equipped organizations, but none for the weaklings, the second-raters. They will eventually be pushed over the edge or swallowed by a larger and stronger competitor.

The swallowing process is probably the one to be expected because it is not viewed with the horror of twenty years ago. Someone has pointed out recently that big business is no longer condemned solely on account of its size. So long as its affairs are carried on with decency as well as efficiency its presence in a community is a matter of pride.

But—what of 1928? What factors affecting business can be listed as favorable?

Generally speaking there is no inflation of prices. In fact, competition has put most prices at an uncomfortably low figure. With few exceptions labor is well employed and its purchasing power is not impaired. Successful crops this last fall have done much to bring the buying power of the farmer into line with that of the man in industry. There are no surface signs of overbuying or of credit stringency. Building construction is expected to suffer no material drop and automobile production bids fair to set a new record. The reduction in Federal taxation of somewhere near a quarter of a billion cannot but be helpful. European conditions are steadily improving and will probably profit greatly if the suggested fixing of the amount of the German war debt, with corresponding adjustments of the Allied debts to the United States, can be consummated.

On the other hand, there is the unescapable fact that 1928 is a presidential year and that any sort of political upset may occur and disturb public confidence. Many of us believe that the effect of a presidential election no longer has the force it had in the past but there are still business men who dread its possibilities. Such being the case it must be considered as an adverse factor.

Almost the only other seriously adverse condition is the dangerously narrow margin of profit on which manufacturers are operating. As suggested in the beginning of this editorial the narrow profit margin is a problem for individual initiative and so long as we have plenty of that we do not have to fear for the future.

Commencing Volume 68

WITH this issue begins Volume 68 of the *American Machinist,* now over half a century old. Starting when the metal working industry, as we know it today, was but a youngster, the journal has grown with it and looks forward to continued service during the period of flourishing strength directly ahead.

The editorial staff charged with the production of Volume 68 consists of Kenneth H. Condit and Fred H. Colvin, editors; L. C. Morrow, managing editor; and S. Ashton Hand, Ellsworth Sheldon, H. V. Doyle, Jr., Frank W. Curtis, F. J. Oliver, Jr., and George S. Brady.

Brown & Sharpe "Standard" Milling Machines

SIMPLICITY of control and convenience of operation are featured in the line of "Standard" milling machines recently developed by the Brown & Sharpe Manufacturing Company, Providence, R. I. They are manufactured in the following sizes: Nos. 2A, 3A universal, and Nos. 2B and 3B plain. The No. 2A universal is shown in the accompanying illustrations.

The machines have many unusual and interesting features to assure profitable operation, such as:

Single lever control for both speed and feed changes with direct-reading dials to indicate the rates of speed and feed

Power fast travel in all directions

Direction feed engagement levers for all feeds provided at both the front and rear of the table

Knee clamped from front or rear of table

Sliding gear feed and speed transmissions

Dry multiple-disk clutch

All-gear drive, using heat-treated, alloy-steel gears

Anti-friction bearings for feed, speed, and power fast travel transmission, as well as the main drive pulley

One-piece knee screw completely guarded at all positions

Automatic filtered oil system for column and main drive mechanism

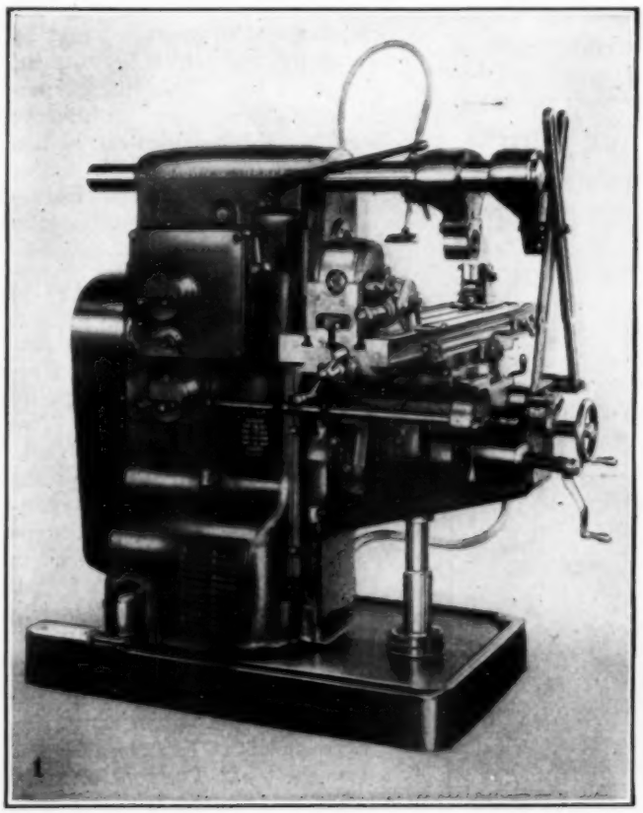
Automatic pump lubrication for the knee

Single-station lubrication for the saddle mechanism and table bearings.

One of the outstanding features of the line is the dual feed control. This construction permits the operator to make table feed changes either from the front of the machine, when in the normal operating position, or at the rear of the table, when face milling and boring. Changes are made by the rotation of a single lever, and the feed in use is shown on a direct-reading dial above the control lever at both positions. These controls can be plainly seen in Fig. 1, connected by a universal jointed telescoping shaft.

The illustration, Fig. 1, also shows the convenient grouping of all operating controls. All controlling levers are thrown in the direction of the movement desired. Power-fast travel is provided for all three feeds on all the Standard machines. This mechanism is driven by gearing through a safety friction clutch. The knee-clamp lever can also be readily reached from either the front or the rear operating positions.

A single lever on the left side of the machine gives all normal changes of spindle speed, and a direct reading dial above the lever indicates the speed for which the machine is set. Two series of speeds are available with back gears. The back gear lever is located within a short distance of the speed-change dial close to the



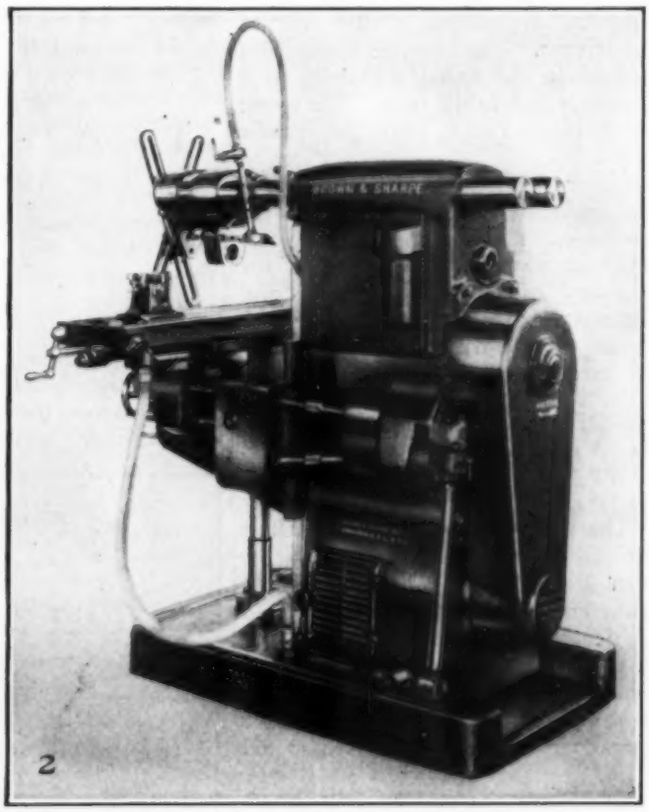


Fig. 1—Brown & Sharpe "Standard" No. 2A Milling Machine, showing dual control of feeds and convenient location of all operating levers. Fig. 2—Right-hand view of the machine showing motor in base construction

spindle nose. Spindle reverse is controlled by a lever located just below the speed-change lever. In Fig. 1 all these controls can be seen.

Simplified oiling of the standard machine is used to assure long life of all parts. All units in the column and driving clutch are automatically supplied with filtered oil. The gage to be seen on the left side of the machine indicates whether the pump is working or not. In order to prevent any possibility of grit in the castings getting into the lubricating system, the inside of the column is coated with a special enamel to prevent any core sand from working loose. The entrance of foreign matter from the outside is prevented by the complete inclosure of the power mechanism. The knee mechanism is also well-lubricated by a pump that automatically forces oil to all moving parts. The complete saddle mechanism and table bearings are oiled from a single well at the front.

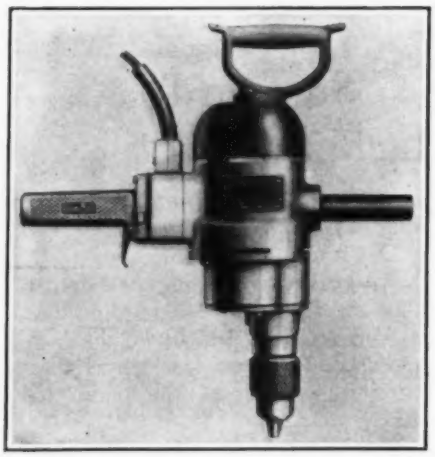
The cutter coolant system on these milling machines is designed to provide either a flood supply or a thin stream. By placing the release valve close to the pump, it is possible to deliver the coolant at the work at low pressure, regardless of the size of the stream. The pump is always immersed in the liquid contained in a reservoir cast in the base. The pump automatically stops when the spindle stops.

Other features of the design are: the double-overarm construction with convenient means for changing cutters; standardized spindle end for economy of cutter equipment; and the adaptability to motor drive with the motor compartment contained in the base.

Van Dorn Standard ½-Inch Electric Drill

The standard ½-in. electric drill is the latest tool announced by the Van Dorn Electric Tool Company, Cleveland, Ohio. It was designed particularly for maintenance work in factories and machine shops. The manufacturers claim that it is the most powerful ½-in. electric drill they have ever offered for its weight and price.

The motor operates on either alternating or direct current. It has a no-load speed of 540 r.p.m., and a full-load speed of 300 r.p.m. The armature is carried upon ball bearings, and the thrust is taken on ball bearings. Hardened alloy-steel gears are used. An automatic safety switch is also a feature of this tool.

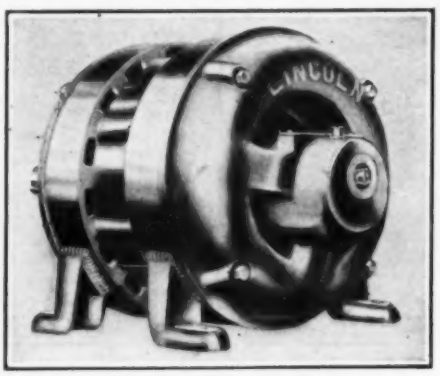


Van Dorn Standard ½-Inch Electric Drill

The drill is equipped with a combination spade and breast plate handle, three-jaw screw back chuck, and 10 ft. of cable with a plug. It is furnished for use with 32-, 110-, 220-, and 250-volt circuits. The drilling capacity is ½ in. in steel. The weight is 14 lb., and the overall length is 15⅜ inches.

Lincoln "Switch Start" Motor

Several advantages are claimed for the "Switch Start" motor made by the Lincoln Electric Company, Cleveland, Ohio. It is built in sizes from ½ to 30 hp., and for either 2- or 3-phase, 60-cycle current. The motor is designed so that it can be started directly across the line without the use of a starting compensator, starting resistance, or other voltage-reducing mechanism, and yet maintain the starting current below the requirements of the National Electric Light Association.



Lincoln "Switch Start" Motor

The chief claim of the new Switch Start motor is that operating characteristics, such as power factor, efficiency, maximum torque, temperature rise, etc., have not been sacrificed in order to secure low starting current. Equal or better efficiency and power factor from 5 to 10 points higher than the ordinary self-start motor are claimed for this line of motors. Tests indicate that the starting torque ranges from 100 to 250 per cent of full load, depending upon the horsepower and speed. From start, the curve of the Switch Start motor shows a gradually increasing torque up to the maximum point.

On sudden high overloads, it is also claimed that the "Switch Start" motor has a very high pull-out torque, so that the motor will not stall.

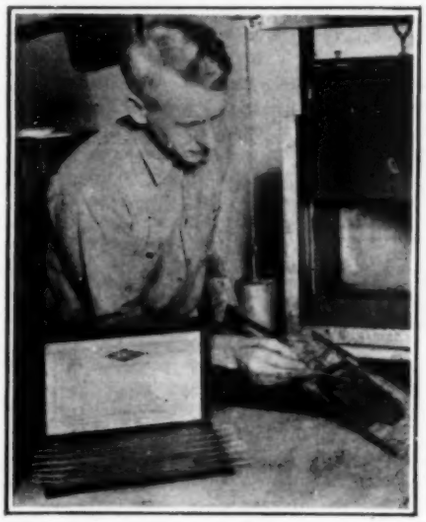
It is claimed further that the temperature rise of these motors under continuous full load is quite low, thus producing long life. This feature is due to the electrical design and also to the welded steel construction, which is characteristic of motors made by this company, and which permits the circulation of air. This line of motors is normally equipped with sleeve bearings, but ball bearings can be had on request. Larger shafts, larger bearings, and waterproofed insulation are also claimed for these motors.

"Temperite Alloys"

Work can be drawn to within plus or minus 5 deg. F. of the proper temperature by means of the "Temperite Alloys" made by the Cornish Wire Company, 30 Church St., New York, N. Y. Fourteen of these alloys are available to cover temperatures ranging from 300 to 625 deg. F. in steps of 25 deg. The alloys are supplied in the form of strips 10 in. in length and $\frac{3}{16}$ in. wide, and come packed in a wooden case.

A piece about ¼ in. long is cut off from the Temperite Alloy strip corresponding to the temperature at which the tool is to be drawn, and is placed on the tool. The tool, or other part being heat-treated, is then heated as usual until the alloy melts. An indication of approach to the correct

temperature can be had by using a piece of alloy melting 25 deg. below the desired temperature. In some cases it is easier to apply the alloy in stick form, as shown in the illustration, by simply rubbing the proper strip against the tool at intervals until the end melts. Whether the pellet form or the stick form is used, it is necessary to use a flux at the point of application. This flux is furnished with the alloys.



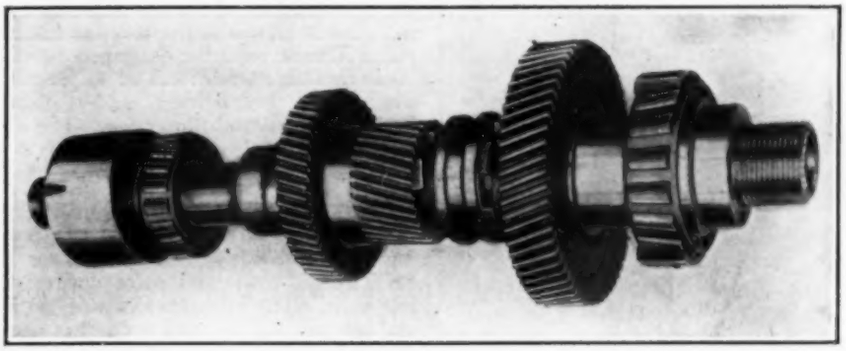
"Temperite Alloys" shown applied in stick form to a tool

Accuracy, cheapness, speed and adaptability to a wide range of temperature and to any size or shape of work are stressed by the makers. The cost is about 2 cents per application.

Monarch Lathes With Timken Roller Bearing Spindles

Monarch lathes, made by the Monarch Machine Tool Company, Sidney, Ohio, are now offered with spindles mounted in precision-type Timken tapered roller bearings as optional equipment. This feature is applied to the entire line of helical geared-head lathes from 14- to 30-in. sizes, inclusive. Ample reserve capacity is available in the bearings selected for each size of lathe, so that the initial accuracy, which is high, should be retained indefinitely.

All end thrust is taken against the front bearing. In fact, in mounting the bearings, an initial thrust load is imposed to remove all radial as well as end movements of the spindle.



Spindle of Monarch Helical-Geared Lathe equipped with Precision Timken Tapered Roller Bearings

Adjustment is provided for the bearing, should it be necessary. Clean, filtered oil is supplied to both spindle bearings, so as to minimize wear due to abrasion.

Because of the fact that there is metal-to-metal contact in the bearings instead of the support being on a film of oil, it is possible to take heavier cuts without chatter or vibration than is possible with plain bearings. The ease and quickness of replacement of the roller bearing, should it be necessary, simplifies servicing.

MacLeod Type B Butt Welder

The Type B butt welding machine made by the MacLeod Company, Station B, Cincinnati, Ohio, is designed to be used where pieces are to be joined together, whether there are thousands of pieces daily, or a variety or occasional jobs to be done. With the MacLeod process of welding, almost any conceivable joining of metals can be obtained, it is claimed. All welders are designed to handle the widest range of work at the highest possible speed.

MacLeod Type B Butt Welder

The welders are designed for operation with alternating current only, and are made for use with 110- (smaller sizes), 220-, 440-, 550-volt, 60-cycle circuits. Machines for use on circuits of other frequencies can be supplied at a slight additional cost.

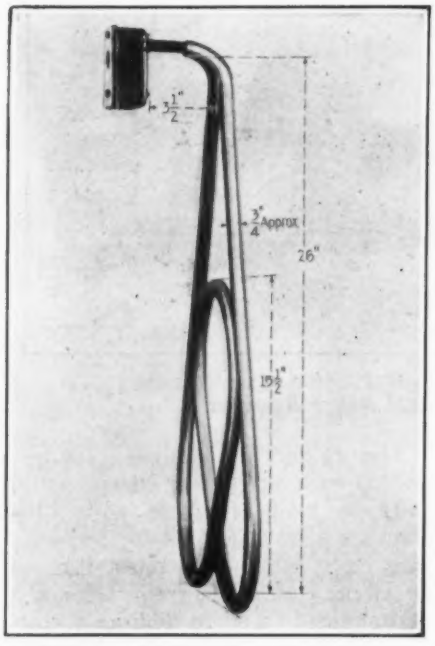
The nature of the work determines the size of welder required. On account of the wide range of application, one size usually answers the requirements of the customer. Eight sizes are available to take care of welding areas ranging from $\frac{1}{32}$ to 5 sq. inches.

The time it takes to complete a weld depends entirely upon the nature of the weld desired, the area, and the rate of the welder. The usual range is from a fraction of a second to over a minute. With the MacLeod welder, two hardened pieces can be welded without annealing more than a length equal to the diameter of the piece. Shanks may be welded to taps, reamers, or drills, without annealing of the body of the tool in so doing. It is claimed that metal frames can be welded around glass lenses without injuring the lense itself.

General Electric Immersion Heater for Electroplating Solutions

An electric immersion heater for electroplating solutions and other liquids that will not attack lead was recently developed by the General Electric Company, Schenectady, N. Y. It is primarily intended for low-temperature heating only.

The unit consists of a steel-sheathed helicoil unit covered with a lead jacket swaged tight to the steel unit. The general shape can be seen



General Electric Immersion Heater for Electroplating Solutions

in the illustration. The terminals are brought out into a terminal box suitable for conduit connections. It is made in two sizes, both rated at 5 kw., for 110-volt and 220-volt circuits, respectively. Only the lower portion of the heater dissipates heat. The upper portion being inactive, allows the unit to be used in tanks in which the level of the solution may be as low as 10 in. from the top of the tank.

Among the advantages claimed for this unit are its ease of installation, portability, the lack of interference with work in the tank, and the minimum maintenance expense. The heater can be supplied in other formations than the one shown in the illustration.

Trade Catalogs

CHUCKS. Jacobs Manufacturing Co., Hartford, Conn., has issued the 25th anniversary edition of its catalog. In it, a standardized line of a fewer number of chucks is announced. Because of the reduction in the number of models, the prices of certain sizes have been reduced. The standardized line of chucks, known as the three-model line of Jacobs chucks, consists of seven ball-bearing "Super" models for use on drill presses, lathes, and other production machinery, eight plain bearing improved models for portable tool and light drilling use, and four of the new self-tightening models known as the Keyless Portomatic Chuck recently described in the *American Machinist*. The catalog is available in several forms, and is pleasingly arranged and illustrated. The dimensions and price lists of all models are given.

BOLTS, HEAT-RESISTING. The Driver-Harris Co., Harrison, N. J., has prepared a small illustrated booklet on its "Nichrome" heat- and corrosion-resisting bolts. The properties of this material are pointed out, and a chart is used to indicate the ultimate strength of such bolts at various temperatures. Numerous fields of application are also indicated.

HOISTS, PNEUMATIC. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has published catalog No. 14 on its air-operated hoists. The publication contains 20 8x11½-in. pages, and is well illustrated throughout with both photographs and blue prints. It gives a very complete description of the various parts that enter into this hoist, followed by a presentation of the various styles of hoists. Hanna I-beam trolleys are also described and illustrated. In addition complete specifications of the hoists are given.

INDICATORS. H. A. Lowe, 1874 East 66th St., Cleveland, Ohio, has published an illustrated pamphlet on the "Last Word" universal test indicator. Six models are shown. In addition to describing the general construction of this instrument, a price list of parts is given with photographs of each for identification by number.

MOTORS. The Louis Allis Co., Milwaukee, Wis., has prepared several bulletins on its products. Bulletin 500 describes multi-speed, squirrel-cage a.c. motors; Bulletin 501, totally-inclosed, externally-cooled, squirrel-cage motors; Bulletin 502, inverted rotary converters, and Bulletin 503, self-start, squirrel-cage motors. In each case the construction and characteristics of the motors are completely described with the aid of specifications and ratings. In the case of the multi-speed, squirrel-cage motors, several pages are devoted to illustrating typical applications. These bulletins are all of uniform size. A summary of the complete line of motors and allied equipment made by this company is given on an additional sheet, Form 10.

ROLLER BEARING JOURNAL BOXES. The Hyatt Roller Bearing Co., Harrison, N. J., has published an attractive booklet describing recent applications of Hyatt roller bearings to railroad journal boxes. The publication contains 44 8½ x 11-in. pages, and is bound in stiff paper covers. Each of the advantages of roller bearings for this class of service is brought out in turn. Typical mounting designs are presented, as well as performance data. A large part of the booklet is devoted to photographs showing various types of equipment to which this bearing has been applied. Miscellaneous applications of Hyatt bearings are also presented.

SWAGING MACHINES. The Etna Machine Co., 3,400 Maplewood Ave., Toledo, Ohio, has issued catalog No. 12 on its swaging machine. The swaging process is first described and then the operation of Etna swaging machines is explained, and some typical examples of work done are presented. Each type of machine is presented by means of a photograph and a table of specifications. Various attachments are also explained by means of cross-sectional views.

Pamphlets Received

ALUMINUM. Three publications on the subject of aluminum were recently issued by the American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York, N. Y. Technical publication No. 31 (Class E, Institute of Metals, No. 10) covers the machining of aluminum. Technical publication No. 32 (Class E, Institute of Metals, No. 11) treats of some aspects of the commercial manipulation of aluminum. Technical publication No. 33 (Class E, Institute of Metals, No. 12) treats of commercial forms and applications of aluminum and aluminum alloys. The papers were all prepared by members of the staff of the Aluminum Co. of America, and were presented at the Detroit meeting of the Institute in September, 1927. All three publications are of a uniform size, 6x9 in., and are illustrated with charts, photographs and drawings. Copies can be obtained from the Institute.

PATENTS. The Annual Report of the Commissioner of Patents to the Secretary of Commerce for the fiscal year ended June 30, 1927, is now available. It may be obtained from the government printing office, Washington, D. C., for 5 cents. The report is brief and is followed by a complete financial statement of the business transacted by the patent office during the fiscal year.

"PATENTS AND HOW TO OBTAIN THEM." Watson E. Coleman, Patent Lawyer, 724 Ninth St., N.W., Victor Bldg., Washington, D. C., has published an interesting little pamphlet on patents under the above title. Such questions as joint inventors, sale of patents, assignments, rejections, trade marks, copyrights, and foreign patents are covered. Some decisions relating to patents are also quoted. The publication contains 24 3½x6-in. pages.

NEWS OF THE WEEK

German Industry Has Made Progress but Profits Are Absorbed by Taxes

Dissention between government and business grows

By Our Berlin Correspondent

DURING the past year German industry has accomplished a long stretch of a steep up-hill climb, and at the end of the year the question arises as to where the credit for this progress should go. Opinions diverge widely in this respect. The government claims the largest share, on account of the assistance it has rendered industry and for having restored labor peace. Industry on the other hand contends that such success as is noticeable is due to its own efforts; that governmental help, with its strong leaning to the labor side, was of little value.

The truth lies somewhere in between, apparently, however, much nearer to industry's standpoint, than to the government's claim. True, the procedure of settling labor disputes by conciliation and official arbitration has succeeded in preventing many strikes that were brooding, but labor conditions are far from peaceful. The state they are in resembles one of an armed truce, or of an unstable equilibrium. What German labor legislation really has accomplished by its policy of arbitration is to force employees and employers into two opposing, organized camps and keep them constantly on the verge of open discontent.

Worker Not Convinced

The worker's discontent is easy to trace to its origin. He draws now more than double of the pre-war wages and officialdom is ever eager to impress upon him, with the help of elaborate statistics of the cost of living, that he is much better off than in pre-war times; but the workman, wholly unconvinced, proclaims that he had more of his money then.

The discontent of the employers has deeper roots. German industrials have now digested the lesson taught by America—that an industry can thrive in spite of high wages; that the eight-hour day is not such a hindrance as was supposed; and that the detrimental effects of both can be offset by more rational working methods, "rationalisierung" as it is called in Germany. What industry chiefly complains of is, that the government which preaches economy to others does nothing to apply it nearer home, and that both labor and government are constantly on the look-out to enlighten industry of the benefits of rationalisierung, mostly achieved with the help of borrowed money, as soon as they become visible, by taxation and more concessions to labor.

Two publications, which have recently appeared, throw some light on the subject as far as relations of industry to the government are concerned. One is a monograph, compiled and issued on behalf of the National Association of German Industry. It is entitled "The Fiscal Burden of German Industry in 1913 and 1925." The other is a statistical report upon German administrative expenditure now and in pre-war times. Both documents, taken individually, speak a very eloquent language; jointly they are an astounding revelation.

Expenses Doubled

The state expenditure has risen from 5 billion M in 1913 to 11.87 billion M in 1925. These sums contain payments for indebtedness, including reparations, according to the Dawes plan. Deducting therefrom such payments the clear expenditure of the administration was in 1913 4.5 billion M, and in 1925, 9 billion M. Taken from these figures the expenditure has doubled but, in fact the increase is considerably higher, because the amounts given do not contain the revenues of the various state departments in their own sphere, like the postal service, law practice, etc., and do not take into account the revenues of a number of highly remunerative, newly created state monopolies like that on spirits. Not an item in the state budget has decreased, even when considering the depreciation of the gold value, except that of the army expenditure, and several have grown at an astounding rate. This is not the place to explain why, but an inkling may be gotten from the fact that the German Post Department has lately raised its rates by 50 per cent, with the result that a letter to a destination just outside of Berlin costs now about 4 cents postage, and that this department has publicly proclaimed that, notwithstanding this increase, it cannot make both ends meet. The question as to where all this money is taken from finds a reply in the monograph of the National Association of German Industry.

Much has been said and written already of present-day German taxation; furthermore there is hardly a native who can find his way through the bewildering tangles of taxes and it would therefore be useless to dwell upon this subject. Only this may be said in explanation: In pre-war times taxation of industry was simple. It consisted of three kinds of taxes: Income tax, trade tax and tax upon real estate. These three taxes are now replaced by no less than fourteen, half of which are levied by the federal government, two by the provincial governments, three by the municipalities and two by all jointly. Under such conditions taxation of industry is not uniform and depends in a measure upon the locality. The association has investigated the subject with 291 industrial firms of all varieties and differing locations. From the results an average was struck which is seen in the following:

Total taxation in	1913 Per Cent	1925 Per Cent
On profit subject to taxation	9.6	163.43
On total invested capital...	0.62	8.44

These figures speak for themselves and need no comment. To obviate the misconception that a taxation of the profits to the tune of 163.43 per cent would prevent German firms making any profit at all, it must be said in explanation that a large part of the taxes contained in this figure are naturally deducted from the income before the net profit is arrived at, which latter is then skimmed by the two or three remaining. Profit "subject to taxation" is not identical with "clear profit." It constitutes the amount which German legislature requires to be shown up before commencing to write off the items requested or allowed by law.

The above figures give only a partial idea by comparison with 1913. Appalling, however, is the loot which the fiscal octopus takes every year from the substance or the total invested capital, by which is understood the complete working capital, including loans and all reserves. Broadly speaking, German taxation devours now as much as firms were formerly proud to show as profits. This explains why, in spite of outwardly flourishing conditions, German manufacturing concerns are not producing revenue; and the reason why the high level of prices cannot be lowered. But not all of it. There are numerous other burdens like those for the workmen's welfare, the contributions to illness, invalidity, insurance funds, etc. They form another chapter and an added incumbency which in effect does not stand very far behind taxes.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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THE year 1927 has ended. At its beginning there were some who expressed the opinion that insofar as general business was concerned the record of 1926 would not be surpassed and might not be attained. This opinion has proved to be correct.

As the year closes, industry, transportation, and distributive trade show a decline from last year's figures that will probably average at least 10 per cent. Perhaps the decrease is greater, but that is unlikely, for a variation of 10 per cent in the volume of America's enormous trade comes very near to being a maximum, and sight should not be lost of the fact that in the consumption of food products there is but little change from year to year.

But most of those who prophesied a commercial reaction also predicted a corresponding decline in the security markets. In respect of this latter prediction their judgment has not been vindicated, for the ease of money and the widely advertised prosperity of the United States has inspired an investment as well as a speculative demand for stocks and bonds that has amazed the reactionaries and surprised even the optimists.

These observations upon the recent past are offered by way of providing a basis for comparing what has happened with the apparent probabilities for 1928. The phrase "apparent probabilities" is used because the chapter of accidents includes so many remote but possible contingencies that only fools would be dogmatic in regard to the future.

One of these contingencies and about the only one that need be considered is a change in the attitude of our investors and bankers toward the foreign demand for American capital in the form of loans. Careful estimates of the amount so loaned during 1927 put it at over two billion dollars, and the total of American loans abroad (not including the inter-ally war debt) is now figured at $14,500,000,000. It is our willingness and ability to lend this enormous sum that has made it possible for us to market our surplus production abroad, and as our tariff makes it impossible for our foreign customers to ship us their merchandise in exchange for ours, it is plain that we must continue to lend in order to sell.

There is nothing in sight at present to suggest a change in our financial policy, but political or social developments overseas that might be regarded as untoward here would make it very difficult for Europe to borrow more in the United States, and from now on conditions abroad should be closely watched.

If they continue to be tranquil and the constructive spirit remains in the ascendant, we ought to have another year of prosperity in this country. But we must be able to market our surplus production abroad and anything that makes this difficult or impossible will have a restraining effect.

An unobstructed export outlet for our admitted excess of production is therefore essential, and with it there would seem to be every reason to expect a normal increase in our domestic trade during the twelve months upon which we are now entering. The caution that has been so widely preached during the last few months has restrained buying. Stocks are moderate and inventories are correspondingly low. Consumers have not anticipated their requirements and the trade "Institutes" have done good work by keeping industrial production in balance with the offtake.

What has been called the "Institute habit" is becoming almost national and its prevalence ought to be reassuring if the line that separates co-operation from illegal conspiracy in restraint of trade is not lost sight of.

Agriculture, which is our most important industry, is, however, without an Institute as yet, and its effective organization is our major political, financial, and social problem.

Until it is solved the nation's prosperity is certain to be somewhat one-sided, and it is to be hoped that some way out of what seems to be an economic impasse will soon be found. That the issue will be an important factor in the pending political campaign is a foregone conclusion, and this probability is the only reason why the presidential election should have any effect upon business. But the tradition which ascribes a repressing influence to the nation's preoccupation in the choice of its chief magistrate should not be ignored, and it may have some influence in the stock market.

Over the year's end call money has been somewhat higher, and if we should continue to export gold until the next harvest permanently higher rates may be seen. But shipments since the present movement commenced in November amount to hardly more than $125,000,000, and they are so small in comparison with our large supply that they are hardly worth talking about.

Therefore there is nothing in the immediate outlook to cause any concern and the quietude of all the markets during the holiday week makes comment upon them unnecessary. Everyone is waiting to see what 1928 will bring forth and hoping that its beginning as well as its ending will be happy. In this hope the writer joins, with the wish that it were in his power to decree prosperity by predicting it.

ON THE following three pages are presented the opinions of many prominent men in the machinery and allied industries. The summaries of the year just closed, and the forecast for the new year, were given exclusively to *American Machinist*.

ANALYSIS of the various reports reveals that 1927 was a year of uncertain trends. For some firms, in certain lines, it was profitable; but to others it brought decreased volume of sales and proportionate falling off in profits. It is also evident that the mid-months of the year were lean ones for most manufacturers and dealers, but that the last two months brought increased sales and a volume of inquiry for future delivery which makes prospects for 1928 a little more attractive than usual.

THE AUTOMOBILE industry is depended on to furnish a great part of the improved business that many of our correspondents predict will come in 1928. Railroads have sufficient funds, but whether they will be devoted to the purchase of shop equipment is never a certainty. General industrialists —as usual—are looked to for the bulk of the year's business and the purchasing of this group will depend on the general business activity in many lines.

THE National Association of Manufacturers, in a recent report, predicts that industry and business will enter 1928 facing one of the keenest periods of competition in history. The volume of trade will reach the peak of last year, but will probably not exceed it.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

"The year just closed was a fair one for machine tool dealers in this territory," says J. Alexander Wilson, president of Wilson-Brown, Inc. "Users who purchased new shop equipment in 1926 when industrial activity was at its height, found that they did not require additional production capacity to handle the business coming in last year, and therefore were not a very profitable source of business in the past twelve months.

"On the basis of present inquiries and the readjustment of supply and demand that must come eventually, I believe 1928 will be a good period in this territory. General economic conditions are sound, money is plentiful and credits are easier. When contemplated new construction projects are begun, and old organizations expand to meet the needs, we shall see a quickening of sales all along the line. I look for no boom in 1928, but for a good, sound and profitable volume of business."

"Our business in this territory in 1927 was not affected by the essened activity in the automobile industry," states Eugene R. Gardner, manager of the New York office of the Warner & Swasey Co. "Generally speaking, the past year was a good one in point of volume, but profits were not satisfactory. Notable advances in re-equipment programs were made by aircraft manufacturers, railroads and machinery jobbing shops. The electrical industry purchased equipment for new developments, but little for its old established lines of manufacture.

"I look for a slow but persistent recovery in the first half of 1928. The second half of the year should be better, since certain re-adjustments of supply and demand, and the settlement of political questions, will result in the development of necessary business expansions. The man who is a hustler and keeps after the probable sources of business during the early months, will be in the best position to profit when the up-turn begins."

John D. Nicklis, vice-president of Manning, Maxwell & Moore, Inc., expects that business in machine shop and mill supplies will be very good in 1928. "We are confident in the outlook that our sales volume will be greater—and more important than that, it will be more profitable. We are concentrating on what I chose to call 'selective business'—that which brings a more equitable profit to the jobber who sells fairly and renders service.

"We shall see a better class of competition in 1928. Dealers have been receptive to the idea that cut-throat competition aids no one, and I am sure that they themselves will bring about certain conditions that will greatly benefit the whole trade. Price will play a great part in this year's business and I believe that most dealers will adhere to the suggested fair price made by manufacturers."

W. F. McCarthy, of Henry Prentiss & Co., says that 1927 closed as it began—with a fair monthly volume. "The first four months and the last three were reasonably good; the intervening five were not satisfactory," he declared. "We could attribute this condition to several reasons; the outstanding one in our opinion, aside from the general let-down in business, was the Cleveland Exhibition. Many prospects during the spring and summer deferred action by stating that they were waiting for the Cleveland show. This in a degree was confirmed by some of the business we have since written. Other prospects which looked good at that time have not closed due to a let-down in their requirements.

THERE is an ample supply of credits at low rates; the somewhat larger stocks of goods which were accumulated during the summer are being reduced; there is no consequential speculation in commodities; the crops have been abundant; wages were at a high level; we are recovering from some partial unemployment, especially in the automobile industry. There is peace in most sections of the labor world, except in the bituminous coal industry; there is more peace in the international world than at any time since the war; the foreign world is recovering its economic strength and buying power and, therefore, our foreign trade is steadily increasing.

DURING the past year there have been important shifts in our own economic world which have an important bearing upon the future. While the average wholesale price of all commodities at about 50 per cent above pre-war is today the same as a year ago, yet if we divide them into agricultural and non-agricultural goods, it will be found that the average price of non-agricultural products has fallen.

THE GREAT extent to which industry has accommodated itself to lower prices by decreased costs makes for a sounder condition for the ensuing year. Despite decreasing prices, production and consumption of manufactured commodities have been maintained upon a high level. As to particular industries, agriculture, textiles, bituminous coal and some metals—still lag behind the others. Taken in a broad sense we enter the New Year with forces of stability dominant in the business world.

Abstract of a statement issued on New Year's Day by Secretary of Commerce Herbert Hoover

"We look to 1928 for a fair business, especially in the first six months. Two factors should contribute to this. First, there will be little carry-over of merchandise for which machine tools are used. Second, improvements in machine tool design affording greater production per unit, should increasingly replace much of the machinery now in use. This market, rather than new industries or extensions to present ones, is in our opinion, where manufacturers must look for their orders in the East, during the coming year."

F. A. Campbell, manager of the New York office of the Consolidated Machine Tool Corporation of America, states that: "The past year saw the usual early year activities with a slowing up in the late summer months. The anticipated quickening in the fall was slow in materializing, and indications are that the increased buying in December will carry over and add to the new year first quarter activities.

"There seems to be no reason why the coming year should not have plenty of action for those who really desire it. Of unusual interest is the growing realization of the need and the desire for efficient, modern, machine tool equipment by the rank and file of users. Obviously, this is a direct result of the efforts of the pioneering machine tool builder and should be the basis of anticipation for a well rounded 1928."

CINCINNATI

Frederick A. Geier, president of the Cincinnati Milling Machine Co., states: "I believe that industrial activity in 1928 will maintain a volume at least as great as that recorded for the past year. This activity will undoubtedly be general, although there is a sentiment that we may expect the greatest percentage of increased activity from the automotive industry.

"The well recognized progressive attitude on the part of the automobile manufacturers will meet the increased competition by further improvement in methods of manufacture, resulting in giving the buyer of automobiles increased values. The machine tool builders are prepared to take a real part in this program."

B. B. Quillen, president and general manager of the Cincinnati Planer Co: "I think that prospects are getting better and in my opinion the first six months of next year will show an improvement. This opinion is based largely on the fact that the market is improving at this time."

Wallace Carrel, vice-president and general manager of the Lodge & Shipley Machine Tool Co.: "The general business tone is now improving and there is, as I see it, more than a ray of hope that the machine tool market will be better in 1928 than it was in 1927. Export orders and inquiries we have received in the past few weeks, though not large, indicate that prospects are brightening in many foreign trade centers, but business from the German field, I think, will depend on future reparations adjustments. The prospects seem better in the automobile field, but I see no basis for a forecast of what railroads will do."

A prominent machine tool manufacturer who asks that his name be withheld said: "There is nothing I can see on the business horizon which indicates any material increase in sales in 1928, speaking of the

machine tool industry as a whole. Comparing 1927 to 1926, I estimate the general falling off in sales to be 25 per cent in the past year. The industry should make some gain in 1928, but there is but faint hope that the sales of the coming year will be as great as in 1926."

H. S. Robinson, sales manager of the Cincinnati Shaper Co.: "I expect our business to show a 40 per cent increase in 1928, comparing it to 1927, because of new models and new efforts. Speaking of the machine tool business as a whole, it should show an increase of 15 to 20 per cent the coming year, comparing it to the past year, but I do not expect it to equal 1926. While I believe that the market will become livelier the coming year I do not expect it to become an 'easy' one."

Arthur J. Larmon, president of the Rahn-Larmon Co.: "In my opinion there will be a better demand in 1928 than there was in the past year. This opinion is based on the fact that business is improving in all mechanical lines, in all sections of the country, and this is bound to be reflected in the machine tool industry. The market in the automotive field will improve, I think, but there still is doubt as to what the railroads will do in the matter of making needed purchases. It seems at this time that the bulk of the business, at least for the next few months, will come from machinists and miscellaneous users who will purchase single tools and replacements."

DETROIT

There are a number of factors that enter into the present business situation that point to a busy year in 1928. The whole country in general, and the Detroit district in particular, seems destined for a substantial increase in business; in fact, an upward trend has recently manifested itself.

The advent of the new Ford car has created unparalled public interest in motor cars, and is bound to result in the sale of more cars of all makes. Practically the entire state is beginning to feel, directly or indirectly, the stimulating effect of expanding production in the Ford factories.

Another interesting feature of the situation in the Detroit district is the number of large new buildings now under construction, or being planned. Each of these projects involves a large amount of money, and the very fact that they are being erected at this time shows that the business leaders of this community have faith in its future.

In regard to the machinery market, automobile builders are realizing more and more that, to keep in the front rank, they must be equipped with the most efficient machinery obtainable. Direct motor-driven machinery is rapidly taking the place of belt-driven equipment.

Robert Handloser, of the Motch & Merryweather Machinery Co., believes that industrial prospects for 1928 are more than usually brilliant. "Everywhere automobile manufacturers are making plans for heavy production," he states. "There is, it is true, a stiffer competition than ever before but as far as the machinery business is concerned this is a healthy thing. The automobile companies are realizing that it will be necessary for them to tighten up in every respect if they are to keep abreast of the times. Methods of production are constantly becoming finer, and partly due to the Ford influence and partly due to other factors, the competitive pressure is becoming intense. As a result of this condition we are selling more equipment and it seems that next year will be an extraordinarily good one.

"It is true, however, that there is some prospect of a deflation, due to the fact stocks and bonds have reached a level so high that it cannot be maintained indefinitely. Whether the purely speculative market can influence the industrial situation to any appreciable extent is a matter that remains to be seen."

Colin L. Campbell, of the Cadillac Machinery Co., says: "I do not see how conditions next year can be anything else but wonderful. Everywhere I go I find such high enthusiasm among manufacturers that it seems certain things are going to improve. In the first place, the world has lots of money. And that means that Detroit will get more than its share; it always has in the past and it will be more true next year.

"Secondly, crops are very good and people are in the buying mood. The automobile companies are making plans for an unusually good year. If they have guessed right, and it seems certain they have, then we are all due for a rare period of prosperity."

CLEVELAND

P. E. Bliss, vice-president of the Warner & Swasey Co., and president of the National Machine Tool Builders' Association said: "The machine tool industry looks forward to a better year in 1928 than it had in 1927. The increased activity in such major industries as the automobile, electrical, equipment, and the general machinery industries, together with the wealth of new and greatly improved machine tools now available, leads to the expectation of considerable replacement business, probably at somewhat higher price levels."

A good year for the machinery and machine tool industry for 1928 is in prospect, according to leaders in the local field. The general resumption of buying and the diversity of new inquiries received in the last three months has stimulated a strong note of optimism for the new year.

H. M. Rich, Sr., secretary and treasurer of the Cleveland Automatic Machine Co., says: "The increase in orders during the last four months of 1927 has helped us to recover from the previous six lean months. Automatic machine business at the present time is on the upward swing; I can not see any immediate cessation of buying."

Col. J. B. Dillard, of the Cleveland Twist Drill Co. stated that "Our business usually picks up sixty days after the steel industry becomes active. I expect to see good business within the next thirty days. Railroads and car builder business has been poor but I can't see where it will be worse. Automobile manufacturers see the necessity of keen competition and I believe the Ford car will intensify the market.

"Twenty per cent of our business is in the foreign market and I believe this amount will be increased during the new year. We are becoming more liberal in our purchases of raw materials in order to be prepared when the tide of new business sweeps in."

E. R. Motch, of the Motch & Merryweather Machinery Co., expresses the view that the new year promises to be better than 1927. Indicative of this is the fact that inquiries are more general. The large road construction programs planned for the year will affect the machine tool industry owing to the increase in business that will naturally result to equipment manufacturers.

MILWAUKEE

E. J. Kearney, secretary and treasurer of the Kearney & Trecker Corporation: "The machine tool industry is always going to be, but seldom is, blessed. Such a pessimistic view in regard to this industry may not be fully warranted, for the reason that there are evidences of better things in sight. Machine tool builders are coming more and more to appreciate the importance of their industry and of the necessity of maintaining it in a prosperous condition, which means better prices, compensation for special engineering work, and for extra service not included in the price of the machine. Better selling practices, the application of modern business methods, together with the apparent flattening out of the sharper peaks and depressions of general business, all point to stabilization and a better average condition for the industry. I am not looking for embarrassing riches in the volume of orders for the coming year, but I do believe that the trend is going to be upward. This upward trend may be largely confined to those designs which have kept pace with the demand for greater and greater production."

R. J. Wilson, president of the Kempsmith Manufacturing Co., says: "I believe that the machine tool business of 1928 will be comparable to that of 1927, with about the same volume, at about the same amount of profit. I can see no indication for an increased business, with the possible exception of in the railroad industry. Prices on machine tools will probably increase shortly after the first of the year, because the lessened volume has made it almost impossible for machine tool companies to make a net profit on their present volume of business."

Clarence R. Falk, secretary-treasurer of the Falk Corporation, states his views like this: "While our business is not very prosperous at this time, we look hopefully toward better times in 1928. Basic conditions are sound, crops were good and the farmer is fairly prosperous, there is no over-production to speak of in any line, and money continues to be plentiful and should continue to be so. The fact that Ford has again gone into production should have a soothing effect upon industry in general.

"Unless something unforeseen looms up on the horizon, and the coming presidential election does not have an adverse influence upon our business conditions, we should, by all visible signs, have a prosperous year in 1928."

CHICAGO

E. P. Essley, secretary of the E. L. Essley Machinery Co.: "This is the open season for prognostications. In planning our work for the coming year we are basing our activity on an estimation of an increase in our business for the whole year over that of 1927 of about 10 per cent. We expect that about two-thirds of this amount will come during the first half of 1928. In our line of business there is usually a definite falling off in midsummer, and this does not usually pick up in any great volume until after the new year.

"As we see it, one of the worst things about the present situation is what has been called 'profitless prosperity.' Most companies of any size are doing business in large volume, but profits are not what they should be. There is a gradual firming of commodity prices, and this, along with the increased agricultural buying power, and the fact that inventories are low, may help profits during the coming year, which will, of course, be promptly reflected in our own business."

A. G. Bryant, manager, machinery department, Joseph T. Ryerson & Sons, Inc.: "Based on indications ordinarily considered accurate, we feel that at least the first part of 1928 will be fairly active in machine tool purchasing. It is quite reasonable to expect that there will be an increased interest on the part of most railroads in adding new machinery, and, no doubt, the automotive industry will require additional facilities for the expected demand.

"The general trend toward special equipment and the application of new types of machines, such as arc and butt welders, friction saws, etc., will, no doubt, continue, and offer the best opportunity for machinery sales. However, the general situation, as viewed from our nineteen sales offices, indicates that the demand for standard machine tools as well as special equipment should improve in 1928 over 1927."

H. W. Jones, president, the Marshall & Huschart Machinery Co.: "The Chicago district is on a broader scale than almost any other, as regards diversity of manufacturing in the metal lines. Some of these lines are in pretty good condition at the present time, and we are certain, at least as to the first several months of 1928, that our sales will be actually better than our average monthly sales for 1927. From indications, there will be a general speed-

ing up of production in practically all manufacturing lines during the year 1928. Railroads anticipate adding materially to their shop, as well as to their rolling stock equipment, the output of automotive and accessory plants is expected to be on a much larger scale than during this year, and manufacturers of agricultural machinery are preparing for a year of exceptional activity, the farmers demanding newer and more efficient implements, which the manufacturers are preparing to give them. In our opinion, general business conditions in 1928 will show an improvement over 1927."

Oliver P. Zimmerman, engineering department, International Harvester Co.: "Judging from our sales for the present year, the largest of any one year for the last five years, and with all indications pointing to a greater degree of prosperity for those engaged in agricultural pursuits, there is every reason to believe that in the year 1928 there will be realized an improvement in business conditions over 1927. The prosperity of the country as a whole to a certain degree is bound up with that of the farming community, and with the assurance that the farmer will reap a reward for his labor, there need be no doubt as to the immediate future. We are making preparations for the requirements of 1928, so far as they can be anticipated, by improving and adding new equipment to our manufacturing plants. Our designers have developed plans for new types of implements and more efficient and more durable models than heretofore have come from the shops of the farm implement manufacturer. We are decidedly optimistic with regard to 1928."

PHILADELPHIA

With the coming of the New Year, Philadelphia builders of and dealers in machinery and machine tools look to the future with a spirit of optimism and much hope. The general industrial situation is such as to justify the belief that 1928 will witness an increase in business and a rise in the trend of buying. In the automotive trade, Philadelphia executives see more cause for hope than in any other line. The railroad situation, too, is hopeful, but offers a more perplexing and uncertain problem.

"We are very hopeful for the future," said Edward G. Budd, president of the Edward G. Budd Manufacturing Co., makers of automobile bodies. "We do not see anything in the present industrial situation that does not look well for an increase in business for 1928. Our customers have asked us for a considerable amount of our goods and altogether we regard the situation as favorable."

"In view of the amazing things that have come from radio in the last few years, he would be bold indeed who would undertake to predict its future," said A. Atwater Kent, president and treasurer of the Atwater Kent Manufacturing Co., producers of radio equipment. "Great as radio's achievements have been, however, its future in my mind is even greater. Which means that all of us in the radio game have ahead of us many more years of thrilling adventure and satisfaction in accomplishment."

Leaders of other lines of industry, particularly those having to do with production for railroad equipment, expressed their opinions freely. The president of one such concern declared "There is going to be some improvement in 1928, but the extent of the added volume is uncertain. We do not look for a large volume. The situation, however, is hopeful."

The president of another company which has been doing business in Philadelphia for 80 years, said that "Business in 1928 will be somewhat better than it was in 1927. This business will, we believe, come from the railroads and from general industrial establishments. We have a number of reports from our salesmen, who inform us that many establishments plan to buy our products next year."

E. M. Herr, president of the Westinghouse Electric and Manufacturing Co., in a recent review stated that: "The year just closing has been a good year for certain industries, but a poor one for others. The automobile industry is an outstanding example of the first; the railway industry of the second.

"The application of electric motors to all kinds of industrial needs has shown progress, and has already reached very large dimensions. As this use is becoming almost universal, progress in this field should continue at a rapid rate.

"Motors are, more and more, being designed to meet special conditions. Because of this, more satisfactory motor applications are being made, which greatly increase the efficiency of the tool or machine to which the motor is applied.

BUFFALO

Leaders in the Buffalo machinery field look with optimism upon the prospects for the year 1928. Generally speaking, results for 1927 have been favorable and there is no reason to believe that 1928 will be less so.

H. W. Wendt, president of the Buffalo Forge Co., said: "The country is in wonderful shape. Farmers have had good crops and have been making some money this year. I can see nothing which might prevent next year from being a good one, even though it is a presidential year. In our business the past year has been exceptionally good, in fact only exceeded in business by one other year and that during the World War. We are beginning the new year with a large list of unfilled orders. Foreign trade has been good and we believe it will be continued. Orders have been comparatively small but of good volume. The best thing to do in 1928 is to forget politics and keep after business."

A. G. Kessler, general manager of the Farrel-Birmingham Co., Inc., successors to the Farrel Foundry and Machine Co., said: "I believe that there will be a good volume of business during the coming year, but that with the tremendous capacity that exists—over-capacity in many lines of business—profits will be close and only those companies whose business is managed and operated most efficiently will present any exceptional balance sheet at the end of the year."

J. L. Osgood, of the J. L. Osgood Tool Co., said: "I do not believe that business in this field in 1928 will be any better than that of 1927. I do not look for any real improvement until after election."

INDIANAPOLIS

Nothing of a startling nature is expected in the machinery or tool business in the Indianapolis area for the next year. Judging from opinions of leaders in the trade, there will be general satisfaction if the volume maintains that of the past year.

For instance, witness the opinion of Lucius M. Wainwright, president of the Diamond Chain Co. "We are feeling mighty comfortable over prospects for the coming year," he declared. "Business with us during the last year was somewhat below normal, but during the fall and early winter there has been a revival of interest and the general situation as the new year opens is very satisfactory. There is no reason to assume that this increase will not go over into the new year. All the signs, insofar as we are able to determine, point to a better business with us during 1928."

O. B. Iles, president of the International Machine Tool Co., of Indianapolis, says business would be good if it could be closed. "We have more inquiries now than we have had for years," he said. "But the difficulty is getting the orders signed. However, the law of averages should bring some business out of this mass of inquiry. Naturally, because of the nature of our machines, the size particularly, the automobile business does not cut much figure with us. However, we are concerned with the railroad and oil business. From all indications we can determine, both these lines of business should be increasing before long. Business during the past year was just about average and if we can show an increase during 1928 over the past year we will be satisfied."

E. B. Knickerbocker, president of the Wayne Machinery Co., of Indianapolis, is not optimistic concerning next year. He said, "If business during the next year is not better than it was during the last quarter of this year, we will have a real kick coming. The first part of last year was not so bad, but the last quarter was terrible. This is the condition we likely will have to endure in the coming year. The farm implement manufacturers are making better preparations for next spring than they did this time a year ago, but in most industrial lines there is a lot of loud talk about optimism, the talk apparently covering up a big lack of confidence in the entire economic situation."

Little change is expected next year from the prevailing conditions of this year in the opinion of Henry C. Atkins, president of E. C. Atkins & Co. "We have had just an average year," said Mr. Atkins, "and there is no reason to expect that much change will be seen in the coming year. If we hold even, we should not complain. Our production during the past year will show a little more than the year before, but due to many conditions, profits are not as large. I do not look for the presidential campaign to figure largely in business conditions this year. I think there will be almost universal confidence among the business and financial interests.

NEW ENGLAND

Frank A. Dorman, treasurer and general manager of the Automatic Machine Co., of Bridgeport, Conn., states that: "The outlook for 1928 from our own particular point of view is very promising. The last six months of 1927 showed a marked improvement in our business, and we look with confidence for a similar trend in the New Year. December has shown us an encouraging list of prospective purchasers of production machinery from which we anticipate good business. Foreign inquiries have been a recent feature and would indicate improved business from that source in 1928. The general trend of industrial affairs will be but little affected by the presidential campaign."

Burton C. Warner, vice-president and general superintendent, the Baird Machine Co., and Baird-Warner, Inc., Stratford, Conn., says: "The Baird Machine Co. has completed a better than normal year, and we look for fair business in 1928. The fact that it is to be a presidential year might have a somewhat depressing effect on business generally. Costs are high and competition exceedingly keen. This calls for the highest development of machinery manufacturing efficiency, and at the best portends a narrower margin of profit. Improvement in the automotive industry will effect our business favorably."

H. K. Spencer, secretary-treasurer of the Blanchard Machine Co., Cambridge, Mass., feels confident that business during 1928 will be at least as good, or probably better than business in 1927. Mr. Spencer bases his forecast on the fact that the automobile industry is out of its uncertainty since the advent of the new Ford car.

Mr. Spencer further enhances his prediction for a successful year when he mentions

Henry D. Sharpe, president, the Brown & Sharpe Manufacturing Co., Providence, R. I., says: "My anticipation of activity in the machine tool industry impresses me that 1928 will show a conservative amount, generally speaking. During the last year demands have been from hand-to-mouth rather than indicative of any future de- that money is plentiful, and that there are no large stocks of finished goods on hand; this, of course, meaning that production will increase, causing an activity along the line.

velopments. Nineteen-twenty-eight will exhibit a continuance only of the immediate past. The industry is like many others, exhibiting signs of the keener competition with a buyers' market as distinct from former years when sellers held full sway. There is no better educated clientele than that enjoyed by the machine tool industry. They have been trained for many years by the best technical press in the world. Designs of machine tools more and more have to be sold on real merit of goods themselves. This results in quality having a field stronger than ever."

Stanley H. Bullard, vice-president, the Bullard Machine Tool Co., Bridgeport, Conn., declared that: "The third quarter of 1927 showed a continuance of the generally satisfactory business, industrial and employment conditions which had been evident during the first six months of the year. The fourth quarter has not been as good generally in Southwestern New England, though in some lines, notably building, there has been an increased activity. The recession has not been serious, nor does it in the opinion of the leaders in our several lines of activity indicate anything other than a reflection of business conditions in the country at large. For the first half of 1928 there appears to be no reason for pessimism. In fact the various metal and machinery fields already have evidence of a forward tendency in their respective lines."

SOUTHERN DISTRICT

That machinery, machine tool and mill supply sales in the Southern district will probably not be as large as in 1927, at least during the first half of the year, is the opinion expressed by some of the leading distributors of such lines in this territory. The reason for this is that while cotton and other important Southern crops sold at high enough prices in the latter part of 1927 to increase purchasing power of the agricultural industry in the South by nearly $300,000,000 compared with a year ago, conditions generally are unsatisfactory in commercial and industrial fields, and machinery and equipment sales are therefore not expected to be very heavy.

In the garage and service station field the opinion is expressed by officials of the Alexander-Seewald Co., Atlanta, one of the largest distributors of this line in the South, that the first half of 1928 will probably be on a par with the first half of 1927, but that the outlook is uncertain for the remainder of the year. About the same situation holds true in the smaller machine shop field, and it is though sales in both these fields will be mainly on a hand-to-mouth basis for some time yet.

J. E. Slider, sales manager for the Walraven Co., Atlanta, distributors of a general line of machine tools, expressed the opinion that 1928 business would be quiet, and that it would not be as large a year as 1927. However, it might be mentioned that 1927 as a whole proved a better than normal year. Indications are that textile mills will not be operating as actively this year as in 1927, and that sales in this field will, therefore, be unusually quiet. In the mill supply line the outlook is for a little better business in 1928 than in 1927.

In the woodworking machinery field business the first half of 1928 promises to be as good as the first half of 1927, but there will probably be a decline the last half of 1928 for the reason that the same period in 1927 was the best for this line since the inflation era following the World War. This opinion is given by J. Frank Cates, of Atlanta, Southeastern distributor of several well known lines of woodworking machinery, and J. W. Sheedy, manager of the Atlanta branch of Henry Disston & Sons, Inc.

Robert Schnore, president of the Southern Bearings and Parts Co., Atlanta, and a director of the National Standard Parts Association, gave as his opinion that business in 1928 would be better than in 1927 in this field.

Road machinery sales are expected to be larger than last year, as Southeastern states are planning more road building than in 1927. Contractors' and building equipment will probably be less than last year as the building outlook is not particularly bright. Railroad shop sales will probably not be as large as in 1927.

CANADA

Present conditions throughout Canada inspire confidence with respect to the outlook for the machinery and machine tool industry during the coming year. Business generally has been gradually improving in recent months, and there is every reason to expect that it will continue at a high level during 1928.

The outlook for the iron and steel industry is favorable. It seems probable that the automobile industry, the railroads, makers of agricultural implements, etc., will all be calling for larger tonnages of iron and steel in 1928 than in the year just ended. Moreover, demands for structural steel should be more voluminous, while miscellaneous manufacturing will absorb the usual quantity. While automobile production and consumption has suffered a notable decline in recent months, manufacturers and dealers are all of the opinion that the spring will witness a resumption of buying on a large scale. Building construction is maintaining a high level of activity, and permits granted during the last two or three months assure a continuance of this condition until the spring at least. There should be an excellent market for mining machinery and equipment. Developments are in progress in the various mining areas which give promise of a considerable increase in production.

Opinions of leaders of the machine building and allied industries, with respect to the outlook for 1928, follow:

Percy Ford-Smith, president and manager, the Ford-Smith Machine Co., Ltd., Hamilton, Ontario, said: "The outlook for the machine tool business is good, and I think it should be a little better in 1928 than it was in the last year or two. Starting with agricultural conditions, which have been generally prosperous in the last two years, and working up to the various industries there has been more prosperity, which should be reflected in the buying of new equipment. I would say that we are not looking for any sudden expansion but that we can confidently look to fair business.

"In 1927 there has been a fair amount of buying of general and special machinery, which most of us are equipped to turn out, and some of the big motor firms have distributed a large amount of work in the way of special machinery, tools, dies and gages. We can expect a fair quantity of this also.

"Continued average prosperity in agriculture and extending up to the various industries should result in the discarding of out-of-date types of machine tools and the installation of much improved tools which are available. I feel that many plants have a program along this line and are waiting sufficient prosperity so that they can spend money on new equipment."

H. G. Bertram, director of the John Bertram & Sons Co., Ltd., machine tool manufacturers, Dundas, Ontario: "As far as our activities are concerned, business for 1927 has been better than any year since the war, and, while we cannot state definitely what the year 1928 holds, we believe that there will be a fair amount of business placed."

T. H. Jordan, president of the Montreal Metal and Hardware Association, expressed the opinion that more automobiles would be sold in Canada in 1928 than in any previous year, and this would be a direct influence on the metal trade.

British Industry Notes Improvement in Manufacturing and Export Trades

Machine tool exports doubled in November

ONCE MORE the turn of the tide in Great Britain is being talked about, the explanation being that the export position has suddenly improved, so that, in the words of one authority, "the outlook for trade appears to be rosier than at any time since the war." The improvement is particularly noticeable in manufactured and partly manufactured articles, and it applies to almost all industries. The machine tool trade is no exception, and the weight of exports in November was almost double that of the previous month. On the other hand, something of a decline was shown in machine tool imports.

In November the total value of imports was more than 70½ million pounds, a sum which, it is true, was markedly exceeded during the boom period of 1920, when the monthly exports were valued at more than 100 million pounds; but allowance has to be made for the decline in money values, and iron and steels were then being sold at two or three times the present prices. Last month, while exports of British productions increased by 9½ million pounds, reexports, that is articles of foreign manufacture sent out, increased by more than a million pounds, and imports by something less than 2½ millions. Exports for the current year, so far, are up by about 46¾ million pounds, but the comparison is of course with the strike-ridden year of 1926, and if 1925 is considered there is still a definite decline. Imports at present are about 15½ million pounds below 1926 figures, and something like 75 million pounds less than 1925. If the figures for December have the characteristics of those for November, the difference between the export and import values will be no greater than two years ago.

While an increase can thus be reported in the value of goods sent overseas, during the same period definite additions have been made from week to week to the number of people registered as unemployed. This may perhaps suggest a lessening in the home demand, though it does not of necessity follow. With the growth of population and the decline of emigration more people are steadily entering into the home field of employment. Thus it has been stated in the House of Commons that between 1922 and 1927 some 1,160,000 people had been placed or had placed themselves in employment.

The iron and steel industries are still in a dissatisfied condition and protectionists are making greater efforts to obtain the imposition of duties on im-

ports. To some extent the position has recently shown a tendency toward righting itself, and, though the indications are not clear in every direction and are, in fact, a little contradictory, it seems at the moment certain that continental competition will become less severe.

After a period of depression, there is at least something of a tendency toward a revival in the call for heavier machine tools, and while this branch of the trade is still very definitely in need of further orders, two or three firms have reported an improvement in conditions. On the other hand the motor industry has not provided as much work of late as had been hoped. Orders are being received, particularly for high production machinery, but not to the extent that had been anticipated. It is altogether too much to say that the automobile industry has been going through a crisis, but, all the same, in one important district at any rate bankers have regarded the position as one of concern. Some part time has been worked. Hesitancy may have arisen to some extent from the need to see what the new Ford program would mean. But since on a price basis the new competitor can be met over here, the situation has cleared to some extent. The decline in 1927 trading was not only shown in smaller and cheaper cars but has also been experienced by one or two firms making larger cars. Overseas trading has not been quite up to expectations, Australia in particular, it is asserted, not having been able to take delivery according to previous agreements.

PROGRESS IN SAFETY WORK

Under the impulse that has been provided by the Factory Inspection Department of the Home Office, Great Britain has taken a leading position in most matters concerned with safety in workshops. An Industrial Museum has now been organized at Horseferry Road, Westminster, S.W., which displays, as far as possible under working conditions, the various devices that are available for guarding machinery, etc., while by means of charts data are given regarding the number of industrial accidents, their causes, etc. Machine tools and woodworking machinery are shown with the various safety devices incorporated. The textile industries are similarly included, as well as the boot and shoe, printing, and other trades.

In view of the work done by the Newall organization on limits and gauges for the engineering industry, it will be with regret that readers in America, as in Europe, notice the passing of the firm of Peter Hooker, Ltd., and the Newall Engineering Co., Walthamstow, London, E., the machine tools and engineering equipment having been bought for resale by a well-known English firm of machine tool manufacturers. It is often stated that the sales of second-hand machine tools are still handicapping manufacturers. The reply of the machine tool firm concerned will doubtless be that if throats have thus to be cut it is well before hand to make a profit on the knife.

Triumvirate Will Rule Steel Corporation

James A. Farrell, for many years president of the United States Steel Corporation and close associate of Judge Elbert Gary, has been appointed chief executive officer of the corporation. This action took place at a meeting of the directors of the corporation on Dec. 27 in New York. There has been much speculation in the industrial world as to who would be the successor to Judge Gary. This speculation was settled when it became known that the directors had divided the management of the corporation among three prominent men.

J. Pierpont Morgan was named chairman of the board, but will not be an executive officer of the corporation. He will merely preside at the bank meetings. Myron C. Taylor, prominent bank official associated with the First National Bank, was elected chairman of the finance committee. This committee coordinates the activities of the board of directors, representing the stockholders and those of the management, which directs the actual operations of the corporation's business. The duties of all three of these men were formerly held by Judge Gary.

The steel corporation appointments, announced after the close of the regular monthly meeting of the board, came a little more than four months after the death of Judge Gary and finally put an end to countless rumors that have been circulating in steel and financial quarters as to who would be selected. The reaction in Wall Street, according to current newspaper statements, was entirely favorable to the selections.

Personals

L. H. INGRAHAM has been appointed sales manager of the E. P. Hurd Co., of Detroit, manufacturer of automotive accessories.

JEROME ALEXANDER has joined the engineering staff of the Vanadium Corporation of America, of New York.

M. CAVALLI has resigned as head of the designing and experimental department of the Fiat Motor Co. He had been with this company for 20 years.

L. A. QUINN, who has been acting manager of the Birmingham office of the Niles Tool Works Co., has been made sales manager in that district.

W. G. GUTHRIE, factory and production manager for the Peerless Motor Car Co., has resigned to become regional production manager in Europe for the General Motors Export Co.

FRANK E. ARTZ has been appointed sales representative in the Chicago territory for the General Manufacturing Co., of Detroit, manufacturer of power presses. Mr. Artz is located at 23 S. Jefferson St.

CLELAND C. ROSS has resigned as plant engineer for the American-La France and Foamite Corporation. He has become chief engineer of the Kellog Manufacturing Co., of Rochester, N. Y.

GEORGE W. MCINTYRE has been appointed direct representative in New York for the Reed-Prentice Corporation, of Worcester, Mass. He has opened offices in the Evening Post Realty Bldg., 75 West St., New York. Mr. McIntyre was for many years associated with the New York and Chicago sales offices of the Niles-Bement-Pond Co.

A. A. ROSENFELDER, for the past seventeen years associated with the Peden Iron and Steel Co., and for the last nine years manager of the machine tool department, has resigned and will establish his own company to deal in machine tools and shop supplies. Mr. Rosenfeld will serve the Southern part of Texas. His present location is at 4620 McKinney Ave., Houston, Texas.

JOHN VAN HORNE has been transferred from the Atlanta, Ga., to the Moline, Ill., office of the Lincoln Electric Co., of Cleveland, Ohio. He will be located at 514 Fifteenth St., and will cover that territory under the direction of the Western headquarters of the company.

M. J. SCHMITT, formerly in charge of the Milwaukee branch of the Kearney & Trecker Corporation, has been made assistant sales manager of the company. Mr. Schmitt will continue to look after the Milwaukee territory, with the assistance of R. F. Shaw, who is being transferred to Milwaukee from the Chicago branch office.

Business Items

The Rome Brass and Copper Co. has purchased the Rome Manufacturing Co., and will consolidate the two organizations.

The Vitek Manufacturing Co., Inc., announces the removal of its plant to a new building at 2606 St. Mary's Ave., Omaha, Neb.

The General Electric Co. announces the establishment of a motor division in its industrial department. F. M. Kimball has been appointed advisory manager.

The International Aircraft Corporation, of Long Beach, Calif., has been purchased by a group of Cincinnati men and the plant will be moved to that city at once. The old Ancor nitrate plant of the government, near Newton, has been purchased and will be made the nucleus of a large plant for the manufacture of commercial airplanes.

The Air Reduction Sales Co., of New York, has acquired the assets and business of the Carolina Standard Gas Products Co., with an oxygen plant at Charlotte, N. C. The addition of this plant gives the Air Reduction organization a total of 110 distributing points for gases, equipment and supplies.

Welker-Hoops, Inc., of Middletown, Conn., auto accessory manufacturers, will start the manufacture of a new automobile gear shift in the plant formerly occupied by the Westinghouse Electric Co., on William St., in that city.

The Link-Belt Co., of Chicago, announces the appointment of the following vice-presidents: George P. Torrence, Indianapolis, in charge of operations and the Indianapolis plant; George L. Morehead, Philadelphia, in charge of Eastern operations and sales; Frank B. Caldwell, in charge of Chicago plant and sales offices; W. C. Carter, in general charge of all production at all plants. Charles Piez is chairman of the board; Alfred Kauffman is president; another vice-president is H. J. Kiely, in New York; and R. W. Yerkes is secretary and treasurer.

The Wilson Welder and Metals Co., Inc., of Hoboken, N. J., announces the appointment of the following representatives for its line of welding wire: Austin-Hastings Co., Inc., Boston; Oliver H. Van Horn Co., Inc., New Orleans; Smith-Booth-Usher Co., Los Angeles and San Francisco; J. G. Cristopher, Jacksonville; Peter A. Frasse & Co., Inc., New York, Hartford, Buffalo, Philadelphia; General Engineering Co., Caspar, Wyo.; North Coast Electric Co., Seattle, Tacoma, Wash., Portland; Geo. A. Post Co., Inc., New York; Steel Sales Corporation, Chicago; Sligo Iron Store Co., St. Louis; Chas. A. Strelinger Co., Detroit; Welding Engineering Co., Bartlesville, Okla.; Williams & Co., Inc., Pittsburgh; Welding Products Co., Birmingham.

Obituaries

EMIL POLLACK, founder of the Pollack Steel Co., of Cincinnati, died in that city on Dec. 25.

JOHN J. CHANDLER, vice-president of the Hoggson & Pettis Manufacturing Co., New Haven, Conn., died at his home in that city on Dec. 18.

JOHN GILCHRIST, chief engineer of the Bloomfield Works of the Westinghouse Lamp Co., died suddenly on Dec. 25 in Newark, N. J.

The Weekly Price Guide

Rise and Fall of the Market

RAILWAY material, sheets, bars, shapes, and plates are responsible for most of the present volume of business in the steel market. Pig-iron and coke continue slow, in direct contrast with the optimistic outlook of steel. Iron and steel scrap prices tend upward, with the exception of cold-drawn material. The latter declined 70c. per 100 lb. at New York warehouses, Dec. 21, 1927.

Pig-iron quotations hold at levels in effect two months ago. The year closed with principal hot-rolled steel products firm at the current price of $1.80 per 100 lb., base, Pittsburgh, in carload or larger lots. During the first week in January, 1927, bars and shapes were $2 and plates, $1.90, f.o.b., mill.

(All prices as of Dec. 30)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities rom warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.05@2.15	3.50	3.25	3.89
No. 12	2.10@2.20	3.55	3.30	3.94
No 14	2.15@2.25	3.60	3.35	3.99
No 16	2.25@2.35	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.50@2.60	3.75	3.55	4.00
No. 22	2.65@2.75	3.90	3.70	4.15
No. 24	2.70@2.80	3.95	3.75	4.20
No. 26	2.80@2.90	4.05	3.85	4.30
No. 28	2.95@3.15	4.20	4.00	4.45
Galvanized				
No. 10	2.90@2.95	4.10	3.80	4.25
Nos. 12 to 14	3.00@3.05	4.20	3.90	4.35
No. 16	3.10@3.15	4.30	4.00	4.45
No. 18	3.25@3.30	4.45	4.15	4.60
No. 20	3.40@3.45	4.60	4.35	4.75
No. 22	3.45@3.50	4.65	4.40	4.80
No. 24	3.60@3.65	4.80	4.50	4.95
No. 26	3.85@3.90	5.05	4.75	5.20
No 28	4.10@4.15	5.30	5.00	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to.30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ¼	⅜	½	¾	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	3.30	3.65	3.60
Cold drawn, flats and squares	3.80	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@½-in. thick. †also shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York	15.37½		
Tin, pigs, 5-ton lots, New York	59.50		
Lead, pigs, up to carlots, E. St. Louis	6.32½	New York	7.12½
Zinc, slabs, up to carlots, E. St. Louis	5.65	New York	6.57½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	14.00	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.25	15½@15¾*
Copper bars, base	22.25	22.25	22.25
Copper tubing, base	24.50	24.75	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	24.30	26@27	26.02
Zinc sheets (casks)	11.00	12.65	10.36½
Solder (½ and ½), (case lots)	36.75	37.50	34@38

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	76.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots..... 35.00 Electrolytic.. 37.00 Shot.....36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	12.25 @12.50	11.00	11.00@11.50
Copper, heavy, and wire	11.50 @12.25	10.75	10.25@10.75
Copper, light, and bottoms	10.00 @10.50	9.50	9.25@ 9.75
Heavy lead	5.25 @ 5.50	5.25	4.75@ 5.25
Tea lead	4.25 @ 4.50	3.75	4.00@ 4.50
Brass, heavy, yellow	7.25 @ 7.50	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.50
Brass, light	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc	3.37½@ 3.62½	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½@18	36.00 per M	.15
Sal soda, per lb	.03¾	.02	.02¾
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.79½	.89	.76
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.27	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%*
Second grade	50–10%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60-10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.033	.04	.04
Brass rods	per lb.	.16½	.16	.1637½
Solder (½ and ½)	per lb.	.36¾	.35¾	.41
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.35
Belting, leather, medium	off list	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$4.95	$5.15
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	2.65@3.00
Coke, prompt foundry, per net ton		Connellsville,	3.75@4.50
White lead, dry or in oil,	100 lb. kegs	New York,	13.75
Red lead, dry,	100 lb. kegs	New York,	13.75
Red lead, in oil,	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in	55%
Larger up to 1 x 30-in	50%
1¼ and 1¼ in. dia	35%
Carriage bolts:	
Up to ½ x 6-in	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in, incl	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.

*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., Los Angeles — Sterling Electric Motors, Inc., 124 West Fourth St. — one 30 ton Lucas forcing press with ratchet holding attached, one shaft centering machine and one La Pointe broaching machine, Nos. 2 and 3.

Mass., Arlington (Boston P. O.)—H. F. Williams, 12 Windsor St.—Sydney Universal woodworker, 32 in. band saw and 16 in. jointer.

Mass., Cambridge (Boston P. O.)—Auto Windshield Garage, 25-31 University Rd., H. H. White, Purch. Agt.—miscellaneous tools and equipment for proposed 2 story repair and service garage.

Mass., Cambridge (Boston P. O.)—Cambridge Sheet Metal Co., 295 Franklin St.—machinery and equipment for proposed 1 story, 60 x 85 ft. auto body shop on Franklin St.

Mich., Detroit—Hudson Motor Car Co., East Jefferson Ave.—machinery and equipment for the manufacture of automobile hoods and sheet metal auto parts for proposed 2 story, 300 x 500 ft. plant on Connors Ave.

Minn., Minneapolis — Gateway Machine Co., 103 First Ave. N.—20 in. shaper, medium size punch press, 36 in. disc grinder and 36 in. Bullard boring mill.

Pa., Pittsburgh—Pittsburgh Steel Products Co., Union Trust Bldg.—5 lathes, 1 planer and miscellaneous equipment.

Vt., Windsor—P. O. Box 52—5 to 10 ton electric cranes, 36 ft. span with 3 ph., 60 cycle, 220 v. motor.

Australia, Adelaide—Supply & Tenders Board of South Australia, will receive bids until March 21, for one 10 in. combination turret lathe with electrical equipment, one vertical turret lathe with thread cutting attachment and electrical equipment, one precision boring, facing and milling machine, one draw stroke shaping machine with electrical equipment and one double headed centering machine with electrical equipment.

Opportunities for Future Business

Ark., Pine Bluff—Choctaw Culvert & Machinery Co., Rand Bldg., Memphis, Tenn., will soon start work on the construction of a factory at Fourth and Michigan Sts. here.

Ill., Chicago—M. Bednarczyk, 2857 West 43rd St., had plans prepared for a 1 story garage at 67th St. and Warren Ave. Estimated cost $50,000. J. Bednarick, 5307 South Rockwell St., Archt.

Ill., Chicago—M. Cohen, c/o Cobb & Eisenberg, 5 North La Salle St., Archts., plans the construction of a 2 story garage at 4426 North Clark St. Estimated cost $75,000.

Ill., Chicago—The Greenview Machine Works, Wrightwood and Greenview Aves., manufacturers of dies and tools, etc. awarded contract for addition to factory.

Ind., Gary—E. A. Barger, 325 West 6th Ave., awarded contract for a 2 story, 125 x 125 ft. machine shop and garage at 22nd St. and Broadway. Estimated cost $90,000.

Ill., Chicago—International Harvester Co., 606 South Michigan Ave., awarded contract for a 1 story, 97 x 120 ft. laboratory at 2500 West 31st St. Estimated cost $25,000.

Ill., Chicago—G. Nord, 7855 Escanaba St., plans the construction of a 1 story garage at 75th and Yates Sts. Estimated cost $125,000. J. Hoche, 1604 East 79th St., Archt.

Ill., Chicago—Southwestern Realty Co., 7149 South Western Ave., had preliminary sketches made for a 1 story garage at Artesian and 69th Sts. Estimated cost $50,000. Private plans.

La., Shreveport—Southwestern Cast Iron Pipe Co., 516 Daizell St., is having plans prepared for the construction of a plant including foundry and machine shop. Noted Nov. 24.

Mass., Dorchester (Boston P. O.)—Edison Electric Illuminating Co., 39 Boylston St., Boston, is having preliminary plans prepared for a 1 story garage and repair shop on Massachusetts Ave. Estimated cost $40,000. Bigelow & Wadsworth, 3 Hamilton Pl., Boston, Archts.

Ind., Indianapolis—Mothershead & Fitton, 542 North Meridian St., will build a 61 x 132 ft. factory and garage at 1325 North Capitol Ave. Estimated cost $42,000. Private plans.

Reported Here in 1927

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Ind., Lafayette—Fairfield Mfg. Co., Wallace Ave. and Belt Line R.R., manufacturers of gears, cutters, etc., awarded contract for a 1 story, 80 x 100 ft. addition to factory. Estimated cost including equipment, $100,000.

Mass., Medford (Boston P. O.)—Samuel Marshall Inc., 43 Tremont St., Boston, will build a 1 story, 140 x 190 ft. repair and service garage on Medford St. Estimated cost $75,000. Private plans.

Mass., Watertown (Boston P. O.)—Watertown Electric Co., S. C. Pitman, Pres., 7 Main St., plans the construction of a 2 story, 90 x 100 ft. garage and repair shop on North Beacon St. Estimated cost $50,000. Private plans.

Mich., Detroit—Hudson Motor Car Co., Gratiot and Knodell Ave., is having plans prepared for a 2 story 100 x 500 ft. addition to auto factory on Knodell Ave. A. Kahn, 1000 Marquette Bldg., Archt.

N. J., Jersey City—H. Byrne, 392 Mercer St., rejected bids for 1 and 2 story, 200 x 300 ft. garage at Mill Rd. and Mercer Wayne St. Estimated cost $150,000. A. Davis, 140 Montgomery St., Archt. Noted Dec. 1.

N. J., Newark — Boyertown Casket Co., Boyertown, Pa., awarded contract for a 4 story addition to warehouse at 344-354 Central Ave. here. Estimated cost $150,000.

N. J., Ridgefield Park—Gulf Refining Co., 21 State St., New York, N. Y., will build a 1 story distributing plant including machine shop, garage, etc. Estimated cost $150,000. Private plans.

N. J., Secaucus (Weehawken P. O.)—Chamber of Commerce, of Union City, 4411 Boulevard, Union City, plans the construction of two airports including machine shops, hangars, etc. Estimated cost $150,000. Architect not selected.

N. J., West New York—N. Buchiarelli, 231 17th St., is having plans prepared for a 2 story, 40 x 100 ft. woodworking plant at 17th St., between Hudson and Dewey Aves. Estimated cost $40,000. F. J. Ricker, 685 Hudson Ave., Archt.

N. J., West New York—Zenith Silk Co., c/o F. J. Ricker, 685 Hudson Ave., Archt., abandoned project for a 2 story, 25 x 80 ft. factory and machine shop at 13th and Jackson Sts. Noted Nov. 17.

N. Y., New York—Ames Transfer Co., 3437 Kingsbridge Ave., is having sketches made for a 2 story garage at Kingsbridge Ave. and 236th St. Estimated cost including equipment $100,000. Ward, Kerrigan & Magnuson, 420 Lexington Ave., Archts.

N. Y., New York—Solomon & Kahn, 475 5th Ave., had plans prepared for a 7 story, 75 x 197 ft. garage at 349 West 38th St. Estimated cost $500,000. Gronenberg & Leuchtag, 1385 Broadway, Archts.

N. C., Charlotte—Southern Sash & Door Co., 11 David St., Greenville, S. C., had plans prepared for the construction of a factory for the manufacture of sash, doors and other millwork products. Estimated cost including equipment $75,000.

N. C., Raleigh—The Belmore Co., recently organized, is reported to be planning the establishment of a plant including machine shop and foundry.

O., Cleveland—The E. F. Hauserman Co., 6810 Grant Ave., manufacturers of metal partitions, awarded contract for rebuilding 2 story, 165 x 200 ft. factory recently destroyed by fire on Grant Ave. Estimated cost $60,000.

Pa., Chester—H. H. Ward, Fourth and Eagle Sts., awarded contract for a 3 story, 59 x 140 ft. factory for the manufacture of sheet material. Noted Nov. 24.

Pa., Philadelphia—The Koppers Co., Union Trust Bldg., Pittsburgh, will build a plant on site of sixty-five acres including coke ovens, etc. Estimated cost $8,000,000.

Tenn., Knoxville—City plans the construction of a municipal garage and storage depot on East 5th Ave. City Engineering Dept., City Hall Park, Engr.

Tex., El Paso—Casner Chevrolet Co., 400 East Yandell Blvd., will receive bids about Jan. 5 for a 2 story, 117 x 120 ft. garage. Estimated cost $60,000. Trost & Trost, Two-Republic Bldg., Archts.

Tex., Fort Worth—Fort Worth Gas Co., c/o G. Crawford, will soon receive bids for the construction of a machine shop and warehouse on South Main St. Estimated cost $150,000. Architect not announced.

Wis., Waukesha—I. B. Roswell Mfg. Co., 1310 Lincoln Ave., plans the construction of a 1 story foundry at 1300 Lincoln Ave. Architect not selected.